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INDEX TO CONTENTS, PAGE 321 - - - - - - - - ADVERTISERS' INDEX, PAGE 22.

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CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

*The Status and Tendency of the Gas Industry, by Walter R. Addicks..... 321

*Free Carbon: Its Nature and Determination in Tar Products, by John Morris Weiss..... 323

*Home Lighting as Shown in a Model Apartment, by Thomas Schofield..... 326

OFFICIAL ANNOUNCEMENT—

Tenth Annual Meeting, Iowa District Gas Association..... 328

EDITORIALS—

Briefly Told..... 328

The Improvements at Worcester—Mr. Young Predicts Government Control—Boston "Gas Meeters"—Deutsche Ausstellung Das Gas—Legal Aspects of Regulation—Wisconsin Gas Association Resolutions on the Death of Thomas J. Cunningham—You Must Keep this Going—Natural Gas Association.

The By-Product Ovens at Bethlehem..... 330

*Industrial Demonstration Rooms, Brooklyn, N. Y..... 331

Public Utility Policy, by H. M. Moore..... 332

Technical Development of Surface Combustion..... 332

Copper Coating to Obtain Soft Areas in Case Hardening..... 332

NEW METHODS AND APPLIANCES..... 334

*An English Range—*Ventilating Coal Pile—Fire-Damp as a Fuel.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 334

Meuch Chunk Election—Mr. Whittaker Lectures—Not an Eyesore—Washington's Demonstration—High Power Lighting—Won't Sell Ypsilanti Plant—Covering Pipes—Henry L. Doherty Company to Compete—Franchise Granted in Cordele, Ga.—Mankato Reduced Rates—Charter for Christiana, Pa.—Ithaca Companies Employees Association—Alma, Mich. Plant—New Holders in Connecticut—Natural Gas Supply Small—Re-opens Kings County, N. Y., Rate Case—Mr. Bartlett Lectures—Floor Moves Coke—Plant for Tecumseh, Mich., St. Petersburg, Fla., Contracts Placed—And Other Items.

UTILITIES COMMISSION NEWS..... 336

New Jersey Limits Shut-Off Orders—Ohio Commission Modifies Order Montana Regulations—Ohio Commission Extends Time—The Sacramento (Cal.) Gas Company.

Financial Notes..... 336

Public Lighting Table for June, 1914.....(Advertising Section) 10

Meeting Times of the Various Gas Associations " 27

The Status and Tendency of the Gas Industry.[1]

By WALTER R. ADDICKS.

The artificial gas business was never in so advantageous a position strategically, as at this writing, yet two influences are felt adverse to progress; the first is an obselete candle power standard; the second, which is not confined to the gas industry, a tendency to deny to proprietorship a percentage return on investments commensurate with the character of the service and the ability of management necessary to produce results demanded by modern conditions.

1. Presented at the Meeting of the New York Section of the Society of Chemical Industry, March, 1914.

Had the incandescent gas mantle, equally useful for coal or carbureted water gas, been invented and perfected before the advent of a supply of cheap oil for gas manufacture, the modern carbureted water gas apparatus, with its high candle power possibilities, would not have displaced coal gas manufacture, or have reached its present important place in the gas industry; it is also probable that electricity would not have had its encouragement to enter the lighting field, the first important step in electrical development. Had the perfection of operation of automobile, followed by other natural mechanical developments, involving large consumptions of oil, not effected the supply of oil for carburetted water gas manufacture, coal gas, while still an ultimate, would not as yet be an immediate necessity to the gas business. These observations are made to direct your attention to a study of cause and effect in this industry.

Electricity has forged ahead in the lighting field and the power field, but in the heating field gas holds a stronger position than ever before, and it is still no mean competitor of electricity in the lighting and power fields. Where the gas engine is used as the prime mover for generating electricity, all phases of lighting, heating and power in the industries, are competitively open to the artificial gas industry. Electric lighting has superseded gas lighting in many cases because the electric units can be conveniently located as required and be controlled from a distant convenient point with ease, and no great care need be exercised to provide against local overheating as in case of gas lighting. Notwithstanding this disadvantage the incandescent gas light is better than electric light in many instances; and more often so than is generally realized, in the home, the factory and the office. Distant control of gas is now possible and will shortly be perfected for gas lighting, with all the safety desirable, and the pilot light is very satisfactory with hand control in ordinary single fixtures. For power purposes gas used in the internal combustion engine is an active competitor as against the steam engine, but must be used with a belt drive when applied to a multiplicity of machines unless used to drive an electric generator. In domestic apartment cooking, gas has already displaced coal and is likewise rapidly driving it from use in private houses and hotel and restaurant work. The gas industry does not fear the invasion of electricity in this field, and even in the fireless cooker field gas is developing types that will meet any probable electric developments in sight. For house and office heating, gas is constantly advancing and with the increasing manufacture of gas from bituminous coal large quantitias of gas coke will come on the market, which, with gas as an auxiliary heating agent, will reduce the use of raw coal in cities. For general industrial uses, including domestic and industrial laundry purposes, gas is progressing very rapidly as will be shown later.

Two interesting developments are attracting the attention of engineers and give promise of wide application; both requiring combustion under greater pressures than are common in street distribution to-day. These are: (1) High pressure lighting, in which the efficiency is double the present ordinary incandescent mantle lighting; and (2) surface combustion, which greatly increases the efficiency of gas used in heating, cooking and the industrial appliances where radiant heat will be of value. High pressure gas lighting may be seen outside of many of the gas offices, good examples being noted at 10th street and 4th avenue, 41st and 42nd streets, west of 6th avenue, New York city. Surface combustion, to my mind, has most fascinating possibilities. The problem is one of development of design and application to present uses.

It is quite within the range of practical expecta tions to fore-see gas supplying heat for water, cooking and industrial operations in sum-

mer; heating of living spaces in spring and fall, and auxiliary to gas coke burned in low pressure boilers in winter. Electricity will supply power for elevator and power use and for lighting, where gas is not so easy applicable, though gas for lighting and power may be found most valuable under certain circumstances.

It is being recognized that the electrical and gas engineers should work together harmoniously to produce the best results in giving the most efficient service to the public. It follows as an essential element that the recent pernicious practice of leaving gas pipes out of buildings must be combatted and architects convinced that their clients interests are sacrificed by so doing. The new office building of the Consolidated Gas Company, at 15th Street and Irving Place, covers an area of 300 by 84 feet, is 19 stories in height, and is completely equipped for both gas and electric lighting, and the gas pipes tested to carry many pounds per square inch, as against the present street pressure of about ½ pound per square inch. No products for

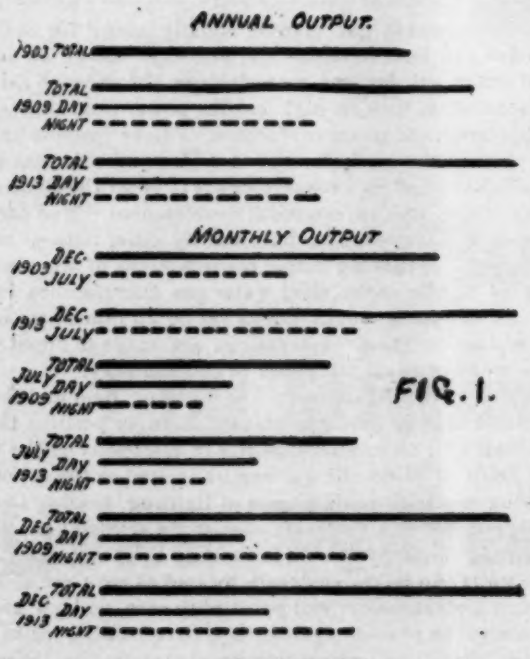

FIG. 1.

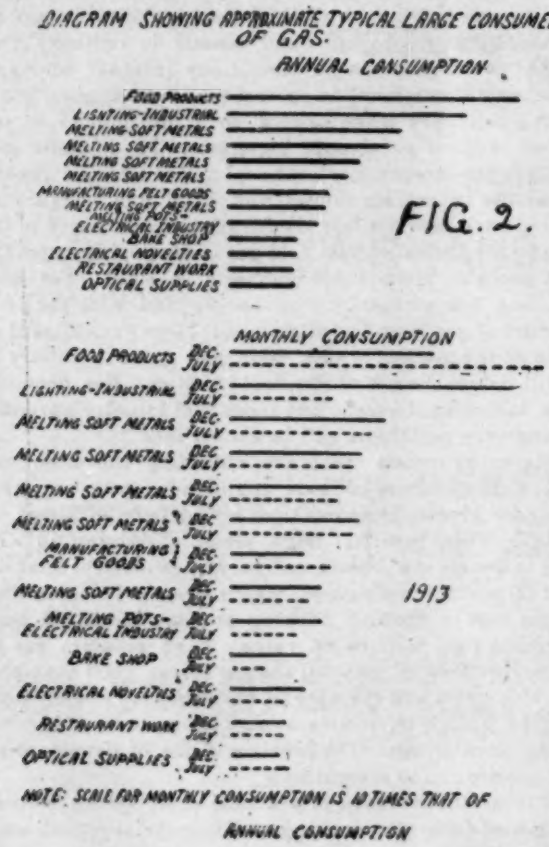

FIG. 2.

light, heat and power will be used save those supplied by the central stations of either the gas or electric industries. This building, when completed in all its parts, will be well worth attention as types of gas appliances for every conceivable use will be displayed.

It is interesting to note the growth of the gas business over a period of years. Fig. 1 shows the relative total 12 months' output of gas in 1903, 1909 and 1913, and the day and night outputs in 1909 and 1913. It also shows the total December and July output in 1903 and 1913, and the day and night outputs in July and December, 1909 and 1913.

Fig. 2 gives a number of examples of sales of gas selected from special industries, showing the annual as well as December and July sales. One is largely for illuminating purposes, while the remainder are fuel users largely. It will be noted that the peak load is not always in December, as was formerly the case when the sales were for illuminating exclusively.

All branch gas offices in New York city have on display many gas burning devices. At Madison Avenue and 42nd Street, will be found a model furnished apartment, as well as a large line of domestic and industrial appliances. At 2nd Avenue and 22nd street is shown a practical working experimental laboratory for public use. The gas company invites any consumer to bring to this laboratory materials for treatment in any appliance suitable, with electricity and gas furnished free for experimental use and instruments for careful measurements. Fig. 3 is a plan of this useful aid to the chemist and practical operator and manufacturer.

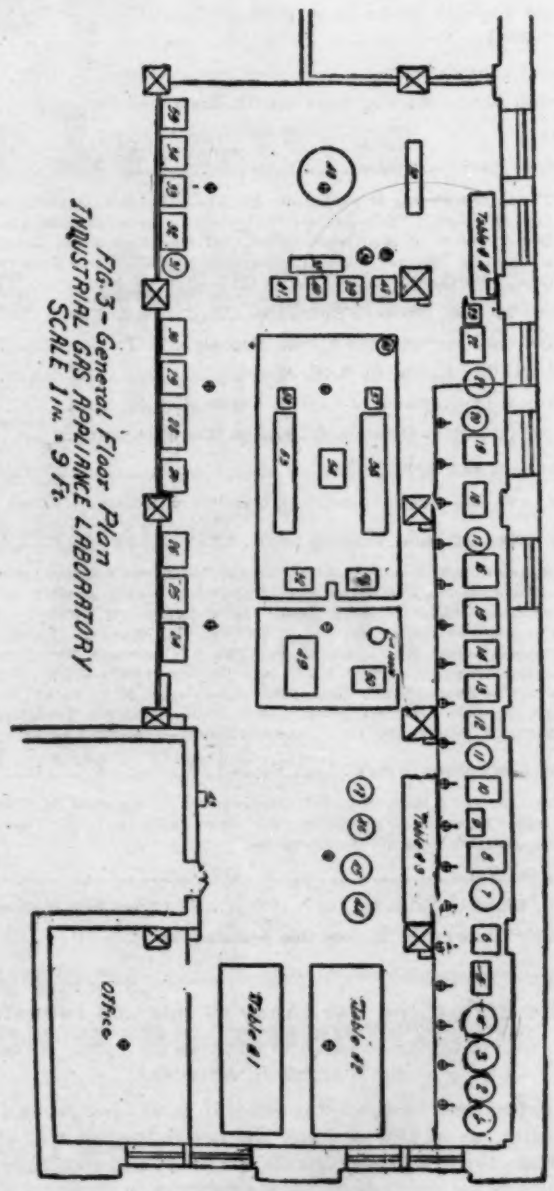

FIG. 3 - General Floor Plan INDUSTRIAL GAS APPLIANCE LABORATORY SCALE 1 in. = 9 ft.

I have here a table of all the appliances in the laboratory, listing the trade number; the name of the appliance; the maximum, not working, gas burning capacity; the range of working temperatures in practical use; and some of the uses for which the appliance is now in service. This table is made up for practical every-day reference,

with the hope that it may be of value in selecting possible appliances for operations that may be profitably performed by gas as the heating agent. The maximum hourly gas consumption of these appliances varies from 5 cubic feet to 1,300 cubic feet, and the working temperatures from 120° to 2,800° F. Higher temperatures are attainable if desired.

The gas engineer no longer assumes that gas cannot be economically used in place of coal for the reason that on a unit cost basis gas has a heavy handicap to overcome when compared with coal on a heat unit basis. From the point of view of heat units only, no one would suppose that a gas-fired steam boiler could be economically used, yet they are used by scores. Elimination of dirt and hard labor, preparedness for an uncertain or irregular demand for manufactured product, immediate answer to sudden maximum demand, absolute uniformity of temperature within a wide range, in fact flexibility to a superlative degree, make gas a most desirable agent for the manufacturing chemist and industrial manufacturer, as well as for all engaged in the familiar example of food preparation in domestic, restaurant and hotel service.

[The table referred to and some 20 photographs of industrical appliances were shown on a screen.]

Free Carbon: Its Nature and Determination in Tar Products.

[From a paper by JOHN MORRIS WEISS, in "Journal of Industrial and Engineering Chemistry."]

All tars contain what has been called "free carbon." It has usually been considered as the material insoluble in hot benzol, and is not pure elemental carbon, but a mixture of this substance with insoluble hydrocarbons and other compounds of high carbon content. The amount of this free carbon varies quite considerably in tars from various sources, depending on the original coal and on the temperature of carbonization and the degree of superheating to which the developing tar vapors were subjected. Under like conditions, the higher the temperature the greater the amount of free carbon in the tar produced. The free carbon in tars from various sources is shown in the following typical analyses:

Kinds of Tar.	Percentage Free Carbon by Toluol Benzol Method.
Semet-Solvay coke oven	10.76
Koppers coke oven	6.79
United Otto coke oven	13.38
Horizontal retort gas works	37.47
Horizontal retort gas works	28.91
Inclined retort gas works	24.31
Vertical retort gas works	3.95
Water gas	0.02
Water gas	0.38
Oil gas tar	1.18
Blast furnace	15.89
Lignite	1.79
Hardwood	0.02
Pine	0.03

As stated before, this insoluble material is not pure carbon. One analysis by Donath and Asriel showed:

Hydrogen	2.3
Nitrogen	3.7
Oxygen	7.13
Carbon	89.2

Hubbard and Reeve have made several ultimate analyses of so-called free carbon, with the following results:

	From	To
Carbon	90.17	94.26
Hydrogen	2.59	3.31
Oxygen	1.81	5.91
Sulphur	0.50	1.78
Nitrogen	No trace upon a qualitative test.	

One analysis of average free carbon from coal tars made in the writer's laboratory showed:

Carbon	89.55
Hydrogen	3.30
Nitrogen	1.10
Oxygen	3.13 (by difference)
Sulphur	1.28
Mineral ash	1.34

I.—*Insoluble Compounds Formed in Mixtures of Tar Products and Various Solvents.*—In the experiments outlined below, chloroform was first used as a solvent, because its low boiling point renders it easy to remove without superheating, and as it has an odor distinct from that of the aromatic hydrocarbons, its removal could be indicated by the odor of the residues handled. The tar was a coke oven tar, containing about 5 per cent. of insoluble matter, by the toluol-benzol method. A weighed quantity of tar (about 500 grams) was diluted with about ten times its volume of pure chloroform and filtered twice through weighed thimbles made of a double thickness of S. and S. No. 575 hardened filter paper. When all material had been passed through the thimbles, these were placed in the extractors and exhausted with hot chloroform. The extracts were refiltered through fresh thimbles, and again extracted. All the thimbles were dried at 100° C. and weighed. The combined filtrates and washings were brought into a tared flask connected to a condenser, and the bulk of the chloroform taken off on a steam bath. The condenser was then disconnected and the material was held at a temperature of 80° C. until it had regained its original weight, less the amount of insoluble matter removed (this amounted to 5.54 per cent.) and at this point, all odor of chloroform had disappeared.

This supposedly carbon free tar was then tested by the toluol-benzol method and also by a chloroform extraction to determine the percentage of insoluble matter. The results were:

Percentage Insoluble in—	Original Tar.	Treated Tar.
Toluol and benzol	5.54	10.05
Chloroform	5.36	0.88

The inference to be drawn is obvious. On standing, chloroform formed a compound with the tar insoluble in benzol. This material is quite different in appearance from ordinary free carbon, having considerable luster and could be sintered together by careful heating. Under the microscope it appeared slightly crystalline. No quantitative test was made on this substance, but on oxidation with fuming nitric acid, a very strong qualitative test was obtained in the resulting solution.

The same tar was then treated in like manner, using pure benzol (benzene) as the solvent instead of chloroform. The tests of this treated tar were:

Percentage Insoluble in—	
Toluol and benzol	4.71
Benzol alone	4.67
Chloroform	2.17

This residue also did not resemble ordinary free carbon, being brown instead of black. Under the microscope, it appeared absolutely amorphous, and on heating, it melted with decomposition and coking.

Slides were made of the original and treated tars, and viewed in a very thin layer with the microscope by transmitted light. Slides were also made by mixing a drop of tar with a drop of the solvent. The magnification used was 87 diameters. They confirmed the analytical tests, and threw further light on the subject. The body of the slides appeared a clear, reddish brown, with the variations noted in the table.

Slide No.	Material.	Appearance.
1	Original tar.	Very granular with amorphous grains of various sizes.
2	Tar treated with chloroform.	Clear, without grains.
3	Tar treated with benzol.	Clear, without grains.
4	Mixture of No. 1 and benzol.	Strongly granular.
5	Mixture of No. 1 and chloroform.	Strongly granular.
6	Mixture of No. 2 and benzol.	Very strongly granular.
7	Mixture of No. 2 and chloroform.	Nearly clear.
8	Mixture of No. 3 and benzol.	Granular and slightly crystalline.
9	Mixture of No. 3 and chloroform.	Granular and fine, needle-like crystals.

The apparent meaning is that the treated tars have no real insoluble

material of the nature of ordinary free carbon, but that materials have been formed which, though soluble in the complex mixture known as tar, are precipitated upon the addition of a solvent. These results indicate that both chloroform and benzol form compounds with some of the tar constituents, which are at least partly insoluble in benzol, and to a lesser degree, in chloroform. These three tars were also tested for fixed carbon and ash.

	Percentages Fixed Carbon.	Ash.
Original tar	15.42	0.13
Chloroform treated tar	14.65	0.02
Benzol treated tar	13.78	0.01

These results indicate (as the fixed carbon was not lowered as much as would be expected by removing 5 per cent. of material nearly all carbon) that simultaneously, higher, more complex bodies were formed which, on heating, give an increased coke residue.

Experiments were then instituted to see whether free carbon would increase with the time the solvent and tar were allowed to remain in contact, cold. In one series of tests, toluol was used as the digesting solvent; in another, benzol. In both cases benzol was used afterward in the extractor.

Time of Standing.	Percentage Insoluble in Benzol.	Insoluble in Toluol and Benzol.
0.25 hour	6.42	5.54
24 hours	6.65	6.30
90 "	7.74	7.55
138 "	9.25	8.44
258 "	10.72	9.34

The reaction is evidently accelerated by the presence of a large excess of the solvent, whether benzol or toluol. With only small amounts of benzol present, such as in an ordinary tar, it is conceivable that this reaction might take place very slowly; in other words, with long time the amount of apparent insoluble matter in a tar might increase.

Tests using carbon bisulphide and chloroform separately, the material under trial being used both in the digestion and in the extractor, gave the following results:

Time of Standing.	Percentage Insoluble in Chloroform.	Insoluble in Carbon Bisulphide.
0.25 hour	5.91	5.84
48 hours	6.93	6.62
120 "	8.27	7.37
216 "	8.01	7.67
288 "	8.21	7.52

A similar increase in apparently soluble matter, as with benzol and toluol, though not to the same extent.

The residues from the chloroform extraction were tested qualitatively for chlorine with positive results. The residues from the carbon bisulphide extractions were assayed for sulphur by the "Eschka" method, the following figures were obtained:

Residue from a	Time of Standing.	Percentage Sulphur.
Benzol extraction		0.92
Carbon bisulphide extraction	0.25 hour	1.46
Carbon bisulphide extraction	120 hours	1.82
Carbon bisulphide extraction	216 "	1.67

Conclusive proof that the solvents enter into combination with the tar constituents.

The writer noticed in some German publications that analine, pyridine and glacial acetic acid have been suggested as the digestive solvent for free carbon determination.

The following results were obtained using these materials for digestion, and then after filtration using benzol in the extractor:

Time of Standing.	Percentage Free Carbon by Digestion with Aniline and Benzol.	Pyridine and Benzol.	Glacial Acetic Acid and Benzol.
0.25 hour	5.00	5.11	6.80
48 hours	4.81	5.23	7.01
144 "	4.62	5.27	8.10

Quite different results with the first two solvents, but acetic acid shows the progressive formation of insoluble compounds. The pyridine is very disagreeable to work with, and expensive and difficult to obtain pure. The filtration of the aniline solution is very slow and tedious, from four to five hours being required to pass 50 cc. through the thimble. In spite of the theoretical aspects, neither pyridine nor aniline seem suitable materials for laboratory assay of free carbon.

It was then deemed advisable to try various tar products. So far, but one tar has been used, and it was possible that it was a peculiar material. A series of experiments on various materials was made, comparing aniline and toluol as the digesting solvents, and using benzol afterward in the extractor.

	Aniline,		Toluol.	
Time of Digestion.	0.25 Hour.	72 Hours.	0.25 Hour.	72 Hours.
Coal tar No. 1	3.22	3.71	5.09	5.31
Coal tar No. 2	12.48	12.83	14.28	17.59
Coal tar pitch	8.68	9.08	13.22	15.15
Water gas tar	0.02	0.17	0.02	0.19

Besides, several substances were tested at 0.25 hour only, using aniline, *versus* toluol:

	Aniline.	Toluol.
Water gas tar pitch	4.11	5.28
Coal tar roofing pitch	20.51	25.57
Coal tar briquette pitch	17.30	21.13
Coal tar paving pitch	13.08	16.72
Road Compound	11.88	13.95

Various filtrates from this last set of tests were examined under the microscope by the hanging drop method. With both aniline and toluol, the first few drops filtered showed a very faint trace of insoluble matter; the remainder of the filtrate was in both cases perfectly clear when examined immediately. The aniline filtrate remained so, even after 24 hours, but the toluol filtrates showed gradual formation of insoluble amorphous grains. The formation of this precipitate was accelerated by further dilution with either toluol or benzol. The aniline solutions, similarly diluted, also showed precipitation, but of a quite different nature, being in the form of clear, fine, crystalline needles. The toluol filtrates showed precipitation on standing alone, the aniline filtrates only after the addition of benzol.

These results are of the same general nature as those with the first tar investigated. In water gas tar products, where the insoluble residue is very small, the differences between toluol and aniline are not marked. Tar No. 1, which shows no increase on standing with toluol, was unusually high in tar acids, and this factor may be the cause of its variable behavior. With substances varying as much as tars do, it would be too much to expect that all varieties would behave in exactly the same way, and it seems sufficient that a majority of those investigated showed similar phenomena. For a practical laboratory test, neither aniline nor pyridine seem suitable. No difficulty is encountered with toluol, carbon bisulphide, chloroform, etc., and it would seem imperative to use solvents of the general nature of these materials.

II.—*Comparison of Various Methods for Determination of Insoluble Matter.*—A. Cold carbon bisulphide method, using a Gooch crucible standard procedure of the American Society for Testing Materials.

B. Toluol-benzol hot extraction method, using a cup made up of filter paper.

C. Standard A. S. T. M. method, using cold carbon tetrachloride as the solvent.

D. The method used in C was supplemented by a hot extraction of the same solvent.

In these experiments, eighteen materials, comprising the common type of pitches and asphalts, were tested by the four methods. All tests were made in duplicate, and every precaution was taken to eliminate all variations. The results are given in the following table: The general consistency of the various materials was about 40° Dow taken at 77° F. for five seconds, under a load of 100 grams.

The carbon tetrachloride methods have never been considered basic for an insoluble matter determination, but merely as supplementary to determine something of the nature of the bitumens soluble in other solvents. Therefore, it would not seem necessary to consider it as a possible solvent for regular "free carbon" tests of tars and pitches. The writer will, therefore, confine himself to a consideration of the relative merits of the cold carbon bisulphide test and the toluol-benzol hot extraction.

On asphalts in general, the Gooch method using carbon bisulphide can be completed in a considerably less time than the toluol-benzol hot extraction, and the results obtained are equally as accurate. But it must not be forgotten that the toluol-benzol method can be used with accuracy on asphalts, and even though it consumes a longer total time, yet the actual time required for the operator is no greater. The extractor, once started, needs no especial attention.

	A.S.T.M. Method Cold CS_2		Benzol Tol. Hot Extr.		CCl_4 Cold Grooch		CCl_4 Hot Grooch	
	1.	2.	1.	2.	1.	2.	1.	2.
Coal tar pitch, horizontal gas retort	34.76	35.05	34.50	35.30	42.41	42.26	38.77	37.94
" " inclined gas retort	32.07	31.95	30.99	30.67	38.22	38.95	34.78	34.85
" " vertical gas retort	10.16	10.47	7.80	8.09	17.25	17.50	15.38	15.90
" " coke oven	19.83	19.64	20.92	21.31	30.38	31.75	27.24	27.01
" " "	17.26	17.48	18.40	18.26	25.97	26.50	23.09	23.41
Water gas tar pitch	2.02	1.98	4.73	5.19	10.31	10.76	9.02	9.21
" "	1.60	1.46	7.92	7.71	14.83	13.31	11.93	11.77
Blast furnace tar pitch	30.20	29,70	28.76	27.95	34.87	35.32	32.82	32.31
Pine tar pitch	4.68	4.60	8.00	7.59	11.67	11.47	11.41	10.97
Stearine pitch	4.61	4.70	(a)	....	....	....	....	....
Bermudez asphalt	5.49	5.43	5.53	5.70	5.73	5.78	5.61	5.71
Trinidad asphalt	24.38	24.43	22.21	22.56	23.34	23.89	22.30	21.17
Gilsonite fluxed	0.14	0.37	0.04	0.07	0.23	0.29	0.24	0.26
Grahamite fluxed	0.12	0.12	...	....	0.37	0.32	0.30	0.32
California asphalt	0.46	0.46	0.27	0.39	0.43	0.41	0.43	0.41
Mexican arphalt	0.30	0.29	0.57	0.47	0.30	0.49	0.30	0.40
Texas blown asphalt	1.11	1.33	1.26	1.36	1.13	1.09	0.96	0.96
Texas straight run asphalt	1.25	1.36	1.71	1.84	1.83	1.51	1.85	1.48

(a) Not considered worth recording.

The carbon bisulphide cold method is, however, not readily applicable to tar products. It is troublesome and slow. All our experience tends to show that a cold solvent is not desirable for tars and pitches. For these materials, the hot toluol-benzol method is far more convenient and easy of application. An aromatic solvent being the natural solvent for tar products, made up as they are of mainly aromatic compounds.

III.—"*Free Carbon*" *Method Recommended.*—I now turn to a description of the "free carbon" method recommended, using toluol and benzol as solvents. This method in all its essential details has been in use in all of the laboratories of the Barrett Manufacturing Company for a period of years, and has been adopted by a number of outside laboratories. For accuracy and ease of manipulation it has given satisfactory results.

Percentages of Free Carbon in	Coal Tar Pitch No. 1.	Coal Tar Pitch No. 2.	Coal Tar No. 1.	Coal Tar No. 2.
Laboratory 1	23.40	38.13	28.67	12.24
" 2	24.26	36.44	28.61	13.31
" 3	23.40	39.40	28.89	13.30
" 4	23.41	40.79	29.52	15.26
" 5	24.03	40.71	29.27	13.48
" 6	23.70	38.43	29.49	13.19

At present, much closer checks could be obtained, and such discrepancies as Tar No. 2, Laboratory 4, would be entirely obviated by changes in the form of the extractor, the steam bath, and supplementary apparatus. Following the results noted in the early part of this paper, the operator should be cautioned against allowing the pitch or tar to digest too long with the toluol. At the outside, 30 minutes should suffice. This feature may have caused some of the discrepancies in check testing on the high side, as at the time of first putting forward this test, the possibility of formation of insoluble compounds was not recognized.

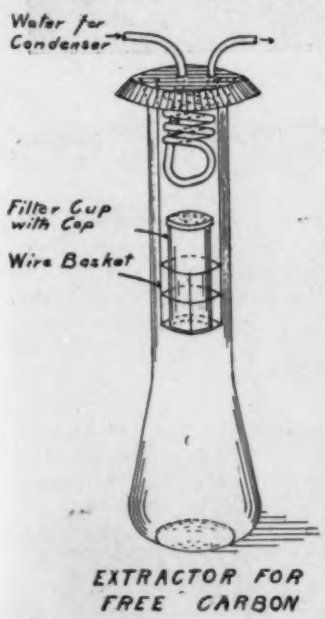

Fig. 1.

Apparatus.—The extractor is shown in Fig.1. The flask being 1¾-in. inside diameter at the top, 2½ at the bottom and 9½ inches in height. On the lower side of the top are too small hooks to hold the wire carrying the paper thimble, and the wire basket is of German silver. Any type of steam or hot water bath will do for heating. We have constructed a bath, which is very satisfactory in operation. It is a copper rectangular box 18 inches long by 5 inches high. Half way up is a perforated false bottom, on which the extraction flasks rest, and below this is a steam coil of ¼-inch copper pipe. An S bend through the box, giving about 54 inches of pipe, is ample. The top of the box contains two rows of four circular holes each, the openings having a diameter of 2¼ inches. At each corner of the box are uprights carrying a plate of copper the same size as the top of the box, and 6 inches above it. This plate is cut out with openings directly over those on the top of the box and of the same size, this arrangement serving to steady the flasks. Four condensers are used in series, so that at one end of the box there is provided a water inlet with cock for each row of flasks. The box is filled with water, and the coil keeps this water hot enough to boil the benzol in the extraction flasks. The spent water from the condensers drains into a constant level device, and by this means sufficient water is added automatically to replace that lost by evaporation from the box. The bath is shown in Fig. 2.

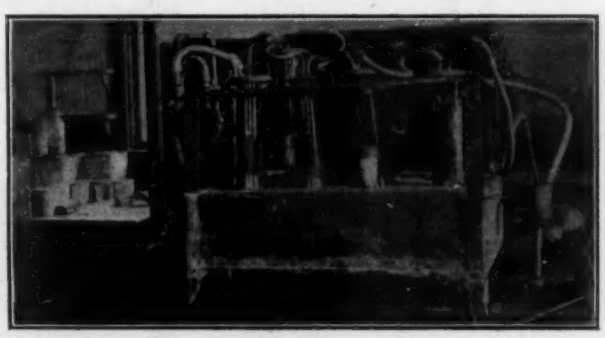

Fig. 2.

Analytical Procedure.—If tar is to be assayed, it must be dried before testing, and after drying it is passed hot through a 30-inch mesh sieve, to remove foreign substances. Pitch requires no previous treatment, other than to insure an average sample. In testing materials of 5 per cent. or more carbon content, 5 grams should be taken, with lesser percentages, 10 grams should be used. The amount is weighed out in a 100 cc. beaker, and digested with about 50 cc. of c.p. toluol on the steam bath for a period not to exceed 30 minutes. If the solution is kept hot and constantly stirred, the digestion can be completed very rapidly. A filter cup is weighed in a weighing bottle and placed in a carbon filter tube over a breaker or flask. The toluol-tar mixture is now decanted through the thimble and washed with hot c.p. toluol until clean, using some form of policeman which is unaffected by toluol, for the purpose of detaching any carbon which may adhere to the beaker. The cup is finally given a washing with hot c.p. benzol, and then, after draining, is covered with a cap of filter paper or alundum, and placed in the extraction apparatus in which the c. p. benzol is used as a solvent. The extraction is continued until the descending benzol is colorless. The thimble is then removed, the cap taken off, dried in the steam oven, and weighed in the weighing bottle after cooling in the desiccator. The balance used for this work should be accurate to at least a half milligram.

One thing which must be kept in mind in free carbon tests, as in other analyses of this nature, is that the results obtained are only proximate, and in order to obtain concordant results, faithful attention to details is necessary. We believe that we have completely standardized all the essential conditions of the test considered, and that it can be applied successfully by workers in general,

Home Lighting as Shown in a Model Apartment.[1]

By Thomas Schofield.

The lighting installation herein described is that of the model apartment maintained by the Consolidated Gas Company of New York, on the second floor of the 42nd street building, at 42nd street and Madison avenue, New York.

Nothing has been spared in the designing of this model home to make it attractive, artistic and absolutely complete, and yet well within the limits of practicability, so that the general public may be educated in the essentials of home comfort and hygiene. This is true of the furnishings, decorations, etc., and especially so of the illumination.

While it is truly said, that the greatest percentage of a man's waking hours are spent away from home, in the office, factory or store, when he returns home at the end of the day's work, he is tired and fagged out from his labors, nervous and fretful over business worries. Therefore should not the greatest attention be paid to the surroundings in which he must place himself while in this condition, and should not an endeavor be made to make them as restful and calming as possible? Again, are not the majority of his hours at home those when the use of artificial light is necessary? And is there anything more liable to cause irritation, discomfort and positive injury, not only to the master of the house, but to the entire family, than a bad or faulty design of lighting equipment? It can readily be seen that this phase of the home's equipment is of very great importance, and should be given serious and conscientious attention.

This apartment consists of reception room, library, dining room, butler's pantry, kitchen and bath room, and a private hall, having an entrance from the 2nd floor corridor of the building. One walks along this private hall and enters the reception room, which communicates directly with the library, which in turn opens on the dining room. Off this last is the butler's pantry, leading into the kitchen. The bath room has its entrance from a small hall immediately off the reception room, and which contains the entrance from the private elevator, thus completing the apartment.

Fig. 1 is a night view of the entrance hall. The walls are wainscoated in dark brown and red leather and finished in a brown Japanese straw paper to the white ceiling; the rug is of soft browns, greens and reds; the furniture chestnut colored wicker with appropriate colored coverings. With the soft lighting, the whole gives that "hint of tranquility" which Emerson demanded in the entrance to the home's inner citadel.

Fig. 1.—Private Hall.

The lighting is by a semi-indirect unit, hung in the center. This fixture is of bronze, with light opal art glass, urn-shaped bowl, ornamented in bronze. It conteins a single inverted incandscent gas mantle unit, which is lighted and extinguished from a wall switch near the entrance. The average intensity on a plane 30 inches above the floor was found to be 1.02 foot candles.

Fig. 2 shows the reception room. Here the prevailing color scheme is deep yellow, which is carried out in the deep buff rug with blue border, and the chestnut colored wicker furniture with dark blue coverings—flowered in reds, yellows and greens. The ceiling is white and the wood trim cream, and the room presents a warm cheerful appearance, suggesting comfort and rest.

Fig. 2.—Reception Room.

The lighting is from a large central semi indirect fixture and one side bracket. The ceiling fixture is of bronze, with a whitish glass bowl, having its decorations and panelings also in bronze. The side bracket is bronze. equipped with two upright units screened with glass shades. The ceiling fixture contains four inverted incandescent mantle units, and is lighted and extinguished from a wall switch near the entrance. The side bracket has 2 small single upright incandescent mantle units. The average illumination on a plane 30 inches above the floor was 2.46 foot candles.

Fig. 3 is the library, This room is decorated in old English style, with a high wainscoating of Flemish oak and furniture of the same wood; the walls above the wainscoating are covered with a light brown paper, having dark red and green flowers. The furniture is covered with red, green and yellow figured tapestry, and with the red rug and hangings touched with gold, blends perfectly with the other decorations. The ceiling is heavily beamed and finished in cream. A stately mantel, with tiled fireplace, is at one end of the room. In lighting this room, special or localized illumination is provided for reading purposes around the center table, in addition to general illumination of the room. The localized illumination is through a dome of hammered copper and deep amber art glass, over this table, equipped with a single inverted incandescent mantle burner, which allows enough light to reach the amber glass to illuminate it for decorative purposes, but directs most of its light downward on a diffusing glass plate, entirely covering the bottom of the dome. This plate serves as a diffuser of light and also prevents the light source being visible to persons seated around the table. The general illumination is by two copper and deep amber art glass mantle standards, equipped with small single upright incandescent units, and by two side brackets and a book-case lamp, equipped with small

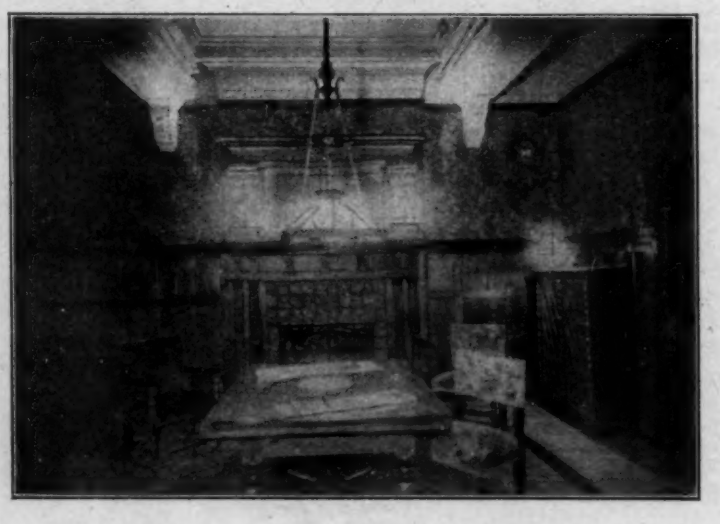

Fig. 3.—Library.

1. From a Paper read before the New York Section, Illuminating Engineering Society.

inverted units, and by a table portable equipped with a single upright unit. The effect produced is of absolute restfulness and complete comfort, and sufficient illumination is available for all purposes. Another point worth mentioning, is the complete harmony of fixtures and decorations and furnishings, a condition too seldom found in the home. Two tests were made in this room, one for horizontal illumination at the table height over the space directly below the dome and 2 feet longer and wider than the library table, and one for horizontal illumination at the table height throughout the rest of the room. A sufficient number of stations were taken in each test to secure a fair average; three readings on a Sharp-Millar photometer at each station. The average local illumination was 2.56 foot candles. The average general illumination 0.84 foot candles.

Fig. 4 is the dining room, furnished in colonial style with cream

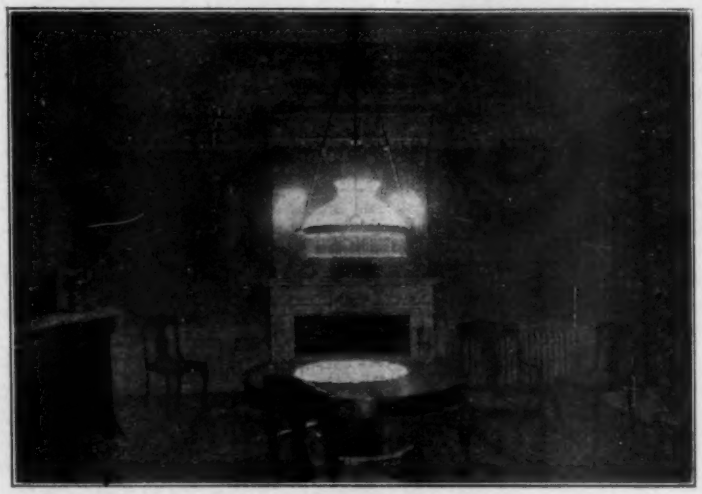

Fig. 4.—Dining Room.

colored woodwork, and paneled ceiling, blue wall coverings and mahogany furniture covered with blue figured hair cloth. The mantle is white, with a brick fireplace. In order to carry out the Colonial period idea the lighting fixtures have been fashioned to resemble old oil lamps. The fixtures are a large dome of etched crystal, with hanging fringe of crystal prisms over the dining table equipped with one upright incandescent burner controlled from a wall switch. This dome also has its bottom closed by a glass plate, assuring good diffusion over the table and preventing the bare light source from coming in the line of vision. The general illumination of the room is by three side brackets fashioned like the dome and each containing a single small upright incandescent unit.

Two photometric tests were made in this room, on the dining room table top with only the dome lighted, and of the average illumination of the rest of the room with all the units burning and a white cloth on the table. The average local illumination was 1.66 foot candles; the average general illumination was 0.66 foot-candles.

Fig. 5 shows the butler's pantry with white tiled floor, enameled tiled wainscoting, white walls, ceiling and cupboards. It is lighted

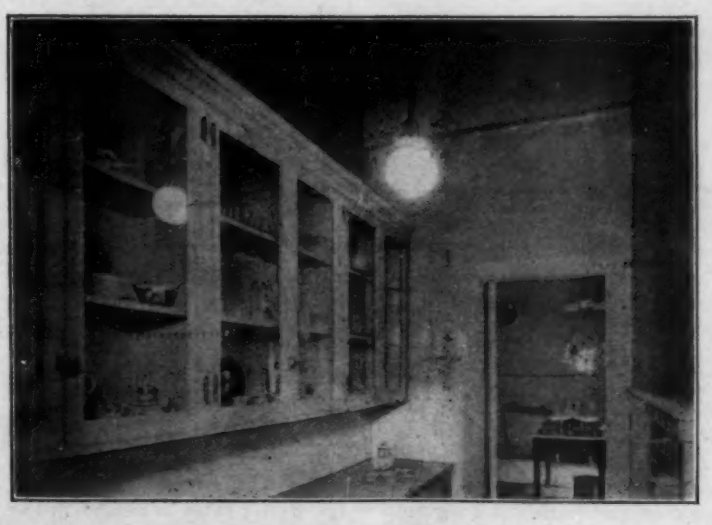

Fig. 5.—Butler's Pantry.

by a central pendant carrying a single mantle inverted lamp with an 8-inch diffusing glass ball, for the general illumination, and a side bracket, over the sink, with a single mantle inverted unit for the local lighting. The control of the ceiling fixture is by a wall switch.

Readings made of the horizontal illumination at 30 inches above the floor, gave the average illumination 3.71 foot-candles.

Fig. 6 shows the kitchen. The construction of this room is abso-

Fig. 6.—Kitchen.

lutely perfect from a sanitary view-point, and nothing which a twentieth century cook could possibly want is lacking. The floor and walls are tiled in white, and the ceiling is the same color. The tables are topped with white glass. This is the brightest room in the apartment. The general lighting is by a central fixture carrying three single mantle inverted units equipped with prismatic reflectors. Local lighting is provided by side brackets over the sink, and over the gas range, refrigerator and side tables, each equipped with a single mantle inverted unit with diffusing glass ball shade. The average illumination was 6.68 foot candles.

Fig. 7 shows the bath room, done in white throughout, with tiled

Fig. 7.—Bath Room (night view).

floor and side walls, and nickel fittings. The lighting is by brackets on either side of the mirror, above the wash stand, equipped with small upright mantle units, with prismatic glassware. The average illumination on a horizontal plane was 1.48 foot-candles.

APPENDIX—ROOM DATA.

Private Hall.

Observed Horizontal Foot Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	1.36	4	0.96
2	1.30	5	0.77
3	1.08	6	0.62

(*Continued on page* 330.)

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NEW YORK, MONDAY, MAY 25, 1914.

[Official Announcement.]

Tenth Annual Meeting, Iowa District Gas Association.

Iowa District Gas Association,
Office of the Secretary,
Des Moines, Ia., April 18, 1914.

The tenth annual meeting of the Iowa District Gas Association will be held in Davenport, Ia., May 27th, 28th and 29th. The headquarters of the Association will be in the Kimball Hotel. Members are urgently requested to make early reservations. Mr. H. J. Carson, General Superintendent, Muscatine Lighting Company, is Chairman of the Committee on Arrangements, and will make reservations on request or furnish any other information desired. The following papers will be presented at the meeting:

"Circular 32 and the Report of Committee on Thermal Value and Candle Power made to the New York State Public Service Commission, Second District," by Mr. Austin Bush.

"Tar," by Mr. Alfred Hansen.
"The Storeroom," by Mr. Geo. G. Kuhn.
"Domestic Appliances," by Mr. C. W. Lockwood.
"The Elements of Gas Rate Making," by Mr. Henry I. Lea.
"Some Distribution Experiences," by Mr. W. H. Merritt.

The attention of the members of the Association is called particularly to this list of papers, which embody the most vital subjects before our industry to-day. In addition, the following standing committees will report: Manufacturing, Distribution, Construction, New Business and Public Relations. One whole day of the meeting will be held on board the Mississippi river steamer, "W. W." Other interesting entertainment features are being arranged.

G. I. Vincent, Secretary.

BRIEFLY TOLD.

The Improvements at Worcester.—Gratifying progress is being made in the construction of the new buildings, and the completion of the extensive improvements at the plant of the Worcester (Mass.) Gas Light Company, on Quinsigamond avenue, and for which approximately $750,000 is being expended. For nearly 2 years the work of enlarging the plant has been under way, and though much has already been finished, General Manager Dana D. Barnum states that about another year will be required to complete the additions to the plant. On April 1, the big holder at Quinsigamond avenue and Lafayette street was placed in service. It cost approximately $250,000, has a capacity of 4,000,000 cubic feet of gas, and is one of the largest holders in New England. It was erected by the Riter-Conley Manufacturing Company, of Pittsburgh, of copper-steel, on a concrete foundation. The other improvements also are by the Riter-Conley Company. The new coke storage and handling plant now nearing completion, is about 60 by 100 feet, and runs to a height of 100 feet. It is of steel and concrete, and will be ready for use August 1. With the new plant in operation the Company will be able to handle something like 300 tons of coke a day. In connection with the coke storage plant there is being erected a Mann trolley runway, over 400 feet long, from the coal storage bins to the retort house, and to the coke house. The foundation for the new retort house has been finished, and the work on the superstructure is now under way. This building is to be 160 by 100 feet, of steel, brick and concrete, with a tiled roof. It will contain 128 retorts, but it is not expected that this building will be ready for service until next winter.

Mr. Young Predicts Government Control.—Mr. P. S. Young, President of the National Commercial Gas Association, has returned from Minneapolis, where he went with Mr. O. H. Fogg, Mr. H. B. McLean and Mr. Louis Stotz, to look over the preparations for the December meeting of the N. C. G. A. Minneapolis daily papers quote Mr. Young as saying: "With an increasing understanding of gas manufacturing problems, Commissions will be able to control the manufacture with fairness to the gas companies. Such regulation is coming and will be welcomed by the companies. From the standpoint of the gas companies the advantage of government regulation will be the use of calmer judgment in the fixing of rates, the protection of the investment, avoidance of plant duplications, and assurance of the permanency of investments."

Boston Gas Meeters.—The Boston Section of the "Gas Meeters," held its last meeting of the season on May 15th, at Suntaug Inn, Lynnfield, Mass. The 70 members who attended found the occasion a most enjoyable one. Mr. I. W. Peffly, of New York, the guest of the evening, entertained the company with reminiscences of his recent trip through South America; and a humorous address by Mr. W. T. Soper, of the Taunton Gas Light Company, furnished the merriment to insure proper digestion. The business of the evening was the election of officers for the season of 1914-15, and the following, offered by the nominating committee, were unanimously elected:

Chairman.—Chas. E. Lasher, of the Pawtucket Gas Company.
Commissioners.—R. A. Fancy, of the Newton and Watertown Gas Light Company; E. P. Ripley, of the Welsbach Company; Frank Cadwallader, of the Wm. M. Crane Company.
Secretary-Treasurer.—A. F. Pettingell, of the Cambridge Gas Light Company.

The greater part of those who attended made an automobile trip over the road to Lynnfield, and altogether the evening was a most enjoyable one and one of the most successful yet held.

Deutsche Ausstellung Das Gas.—The Bavarian Gas Exposition in Munice, will be opened on July 1st, by King Luding, and the preparations made indicate that it will be of particular interest to Continental engineers. The Deutsches Verein von Gas and Wasserfachmannern will hold its annual meeting in Munich during the exposition and a good technical program is announced. These proceedings and the principal features of the exposition will be reported for the Journal by a special correspondent.

Legal Aspects of Regulation.—Mr. Chas. F. Mathewson, of New York, has, on several occasions, given particularly clear elucidations of some of the little understood questions of public service regulation, and his remarks before the Finance Forum of the Y. M. C. A., on "Some Legal Aspects of the Regulation of Public Service Corporations," delivered May 11th, were very much to the point. He said that the most essential consideration to customers is efficiency of service, and any mistaken theory of imposition which compels a public service corporation to sacrifice efficiency to lower rates is, and will sooner or later be recognized to be, a greater misfortune to the public than to the corporation.

Rate-making is, of all manifestations, the most serious and common aspect to public service corporations of the special regulatory power of the State. If a legislative act fixing rates is passed in the usual manner, it is possible that it does justice, but if it does so, it is

usually due to Providence only; and such legislation, where a commission is in existence, is vicious to the last degree in principle and usually in result. On the other hand, a commission, said Mr. Mathewson, may proceed at leisure. It has opportunity for complete examination of all essential facts. Its members are in office for a term of substantial length, so that they should be more independent of popular disfavor or popular acclaim than are legislatures. The first matter to be considered is the value of the property employed. It has taken many years and multitudes of decisions to determine what elements of property shall be included in the total valuation, the basis upon which they shall be valued, and the amount (if any) which shall be deducted for depreciation to reach the ultimate base upon which the return is computed. So, too, what constitutes a fair rate of return, but no uniform rate has been or can be settled as applicable to every case. It is necessary further to distinguish between a rate of return which barely non-confiscatory and therefore constitutional and a rate which is commercially just and fair.

Ascertainment of the reproductive value of the physical property involves elements of information and judgment which require engineering skill of high degree. The intangible property may be, and often is, divided into two classes—cost of "organization and development" and cost of "going" or "going concern" value. It is not surprising that the development and organization work may equal 20 per cent. or more of the entire cost of the physical property itself.

In commenting on the recent decision of the Court of Appeals of New York in the Kings County Lighting Company case the speaker disagreed with the expressions of the justice who wrote the opinion. The opinion defined "going value" for "rate purposes" as "the amount equal to the deficiency of net earnings below a fair return on the actual investment" due to the expenditures reasonably incurred in the development of the business and property of the company, in addition to the value of the physical property. Mr. Mathewson believed it to be the sound doctrine that such expenditure represents the value of the "going-concern" development whether there is a deficiency in net earnings by reason of such expenditure or not. The language of the justice, literally read, would indicate that there could be no "going concern" value in the case of a corporation which earned a fair return on the investment from the beginning; and while the discussion may be academic because there is rarely found such a corporation, yet his proposition as quoted is believed to be unsound.

Should "accrued depreciation," so called, be deducted from the cost of reproduction of the company's property, and a return allowed only on the balance of the investment?

Accrued depreciation, as used, does not mean deterioration, which should already have been made good by repairs or replacements; it means expired life of apparatus still operating as efficiently as when new. Thus a gas retort, half of whose estimated period of life has expired, is producing just as much gas, at just as low a cost, as when it was installed; but it is claimed by some authorities, including the New York Public Service Commission, First District, that such retort should nevertheless be included in the valuation of the company's property in a rate case at only 50 per cent. of its cost value.

This theory was recently accepted by the Appellate Division of the Supreme Court in New York State, in the Kings County Lighting case. It has never been passed upon by the Court of Appeals; it is in direct conflict with what Mr. Mathewson understood to be the holdings of commissions in other states, such as Connecticut, New Jersey and Wisconsin, and he believed that it is thoroughly unsound and will ultimately be so held in all courts. It has not been adopted by the Public Service Commission of the Second District, but is wholly contrary to the views of the Engineer of the Public Service Commission of that district, as expressed by him in the Westchester Lighting Company case, and also to the views of the Engineer of the Public Service Commission of the First District, who acted for it in the Kings County Lighting case.

It is true that the Supreme Court of the United States, and some other courts following it, have expressed in general terms the view that some depreciation is deductible in a rate case; but it is fair to say that the subject never has been fully or adequately presented in the Supreme Court, and that that Court has never declared that "theoretical depreciation" should be deducted, representing merely expired life of still efficient apparatus, where it is a question merely of rates for service between a company and consumers. The motto should be "100 per cent. of efficiency and 100 per cent. of return." Nothing else is or ought to be satisfactory either to the company or to consumer.

Wisconsin Gas Association Resolution on the Death of Mr. Thomas J. Cunningham.

Thomas J. Cunningham, Editor-in-Chief of the American Gas Light Journal, passed away May 6th, 1914.

He had been connected with that publication in various capacities for 44 years, having entered the composing room at the age of 17.

During this period of nearly half a century, his loyalty and devotion to the gas interests never flagged, and the benefits derived by these interests cannot be estimated. He was always ready to foster the welfare of gas men collectively and individually, and those who were fortunate in his personal acquaintance and friendship, realize this most.

His heart, hand and talents were ever zealous in the support of the Gas Associations, realizing their inestimable value to the individual as well as the industry, of associations brought about by such means and the interchange of thought and experience tending toward greater economies, enlargement of the field, and betterment of the service to the public.

It is therefore with deep regret that we record his death and this memorial is spread upon our records at the instance of those who hold him in grateful remembrance, not only as Editor of the oldest gas journal published in this country. but, also, in memory of the man who may have a successor, but whose place will never be filled.

J. N. Walker.
E. L. Pratt, } Committee.
T. D. Miller,

You Must Keep This Going.—The "Annalist," (New York), in speaking of the endless race between gas and electricity, says that when, 30 years ago, electricity became a formidable competitor of gas, many investors, fearing that the gas com panies were immediately to be put out of business, made haste to sell their holdings. They have had plenty of time and reason to repent having jumped to that conclusion. While it is true the infant of 30 years ago has grown wonderfully, it is also true that the gas industry in the same period has developed in a remarkable though less spectacular manner. One industry has not, as many are wont to suppose, made progress at the expense of the other. They have forged ahead side by side. Competition, keen but healthy, has stimulated the growth of both.

Their most active rivalry has been in the field of illumination. When the arc light and the incandescent electric bulb made their appearance, the gas companies found themselves on the defensive, confronted by the problem of how to combat the rapidly growing popularity of the new service. To do this it became necessary to improve gas lighting methods. Necessity, as always, proved itself equal to the emergency, and invention was called into play, the lustre of the incandescent lamp was dimmed by the introduction of the Welsbach burner. This was a challenge to the electric companies, later answered by the Tungsten lamp.

Neither side has relaxed its efforts to gain the favor of the public. While the contest has been going on, the people generally have been taught to use more light, and, incidentally, they have learned how to use it better, by paying more attention to the laws of diffusion, hygienic results and a greater amount of "light comfort" can be obtained—and consequently they have become more exacting. Both the gas and electric companies are striving to the utmost to meet these requirements by developing new and more effective types of lamps and fixtures. They are devoting quite as much effort to improving methods of outdoor lighting as better indoor illumination, the public having come to appreciate the fact that well-lighted streets and highways are conducive to improvement in social conditions. This should be encouraging to gas men, but also as demanding unceasing and increasing effort. The lighting business can be gotten and kept if the right attention is given it.

Natural Gas Association.—Last week's meeting of the Natural Gas Association of America, in St. Louis, gave a great deal of time and attention to the subject of "Conservation" of the supplies of natural gas; and the urgent necessity of increasing rates at which it is sold to consumers, because of decreased supply and expense of piping from distant fields. J. M. Atkinson, Chairman of the Missouri Public Service Commission, was one of the speakers on "Rates," and Director Holmes of the U. S. Bureau of Mines, discussed the subject of "Conservation." "Losses in Transportation" was treated by A. S. Diecher, and other problems of the producer were discussed by G. A. Burrell, F. M. Seibert, F. W. Stone and others. Six hundred delegates were reported as attending, and Cincinnati was selected for the 1915 meeting.

(*Continued from page 327.*)

Dimensions of hall—17 feet 9 inches x 6 feet 8 inches; height of ceiling—12 feet 2 inches; number of fixtures—1; number of burners per fixture—1; size of burner—No. 6 Reflex; distance bottom of bowl to floor—7 feet 2 inches; spread of fixture—12 inches; glassware—Equalite; fixture finish—acid bronze; gas pressure—3.70 inch; gas consumption—4.30 cubic feet per hour; cubic feet gas per square foot area—0.0364; height of test plane—30 inches; average horizontal foot candles—1.02; lumens effective per cubic feet gas per hour—28.04.

RECEPTION ROOM.

Observed Horizontal Foot Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	5.39	6	2.47
2	2.54	7	2 80
3	1.80	8	1.76
4	2.33	9	1.73
5	2.77	10	1.04

Dimensions of room—20 feet 6 inches x 15 feet 11 inches; height of ceiling—11 feet 2 inches; number of fixtures—1 ceiling, 1 side bracket; number of burners per fixture—ceiling 4, side brackets 2; total number of burners—6; size of burners—4 No. 6 Reflex, 2 Welsbach Juniors; distance bottom of bowl to floor—7 feet; spread of fixture—1 foot 10 inches; glassware—Equalite; height of side brackets—5 feet 9 inches; fixture finishes—acid bronze; gas consumption—21.20 cubic feet per hour; cubic feet of gas per square foot of floor area—.0657; average horizontal foot candles—2.46; lumens effective per cubic feet gas per hour—37.41.

LIBRARY.

Local Illumination. *General Illumination.*

Observed Horizontal Foot Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	2.66	1	1.13
2	2.81	2	0.51
3	2.77	3	0.54
4	1.98	4	0.58
5	2.60	5	0.38
		6	0.68
		7	0.60
		8	1 44
		9	1.24

Local Illumination: Dimensions of space tested—9 feet x 7 feet 6 inches; height of ceiling—11 feet 10 inches; number of fixtures—1; number of burners per fixture—1; size of burner—No. 6 Reflex; distance bottom of dome to floor—5 feet 1 inch; glassware—amber art glass; fixture finish—hammered antique copper; gas consumption—4.30 cubic feet per hour; cubic foot gas per hour per square foot area—0.0637; average horizontal foot candles—2.56; lumens effective per cubic foot gas per hour—40.19

General Illumination: Area of space—219.0 square feet; number of fixtures—6; number of burners per fixture—1; size of burners—3 Bijou, 2 Welsbach Jr., 1 No. 71 Welsbach; height of side brackets—5 feet 11 inches; height of mantle lamps—6 feet; glassware—amber art glass; fixture finish—hammered antique copper—gas consumption—11.94 cubic feet per hour; cubic feet gas per hour per square foot area—0.0545; average horizontal foot candles—0.84; lumens effective per cubic foot gas per hour—15.40.

DINING ROOM.

Local Illumination. *General Illumination.*

Observed Horizontal Foot Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	2.75	1	0.58
2	1.34	2	0.75
3	1.34	3	0.65
4	1.34	4	0.72
5	1.48	5	0.75
		6	0.62
		7	0.55
		8	0.48
		9	0.64
		10	0.83

Local Illumination: Area of space tested—15.0 square feet; height of ceiling—11 feet; number of fixtures—1; number of burners per fixture—1; size of burner—No. 71 Welsbach upright; distance bottom of dome to floor—5 feet 5 inches; glassware—etched crystal; fixture finish—old brass; gas consumption—4.44 cubic feet per hour; cubic feet gas per hour per square foot of area—0.296; average horizontal foot candles—1.66.

General Illumination: Area of space—289.0 square feet; height of ceiling—11 feet; number of fixtures—3; number of burners per fixture—1; size of burners—Welsbach Junior; height of brackets—6 feet 3 inches; glassware—etched crystal; fixture finish—old brass; gas consumption—6.0 cubic feet per hour; cubic feet gas per square foot area—0.021; average horizontal foot-candles—0.66.

BUTLER'S PANTRY.

Observed Horizontal Foot-Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	2.28	4	4.52
2	2.90	5	5.08
3	3.76		

Dimensions of room—11 feet 5 inches x 5 feet 11 inches; height of ceiling—12 feet 2 inches; number of outlets—2 (1 ceiling, 1 side bracket); number of fixtures—2; number of burners per fixture—1; size of burners—No. 6 Reflex; distance ceiling fixture to floor—7 feet 4 inches; glassware—8 Verre Krasna Ball; fixture finish—acid bronze; gas consumption—4.30 cubic feet per hour; cubic feet gas per hour per square foot area—0.0637; average horizontal foot-candles—3.71; lumens effective per cubic foot gas per hour—58.24.

KITCHEN.

Observed Horizontal Foot-Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	6.35	6	5.30
2	7.50	7	9.41
3	6.45	8	6.77
4	4.25	9	6.56
5	7.53		

Dimensions of room—19 feet 1½ inches x 18 feet 9 inches; height of ceiling—12 feet 2 inches; number of fixtures—5; number of burners per fixture—1 with 3, 4 with 1; size of burners—No. 6 Reflex; distance ceiling fixture to floor—7 feet 3 inches; glassware—No. 6321 Holophane; fixture finish—acid bronze; height of side brackets—5 feet 5 inches; glassware—Verre Krasna Balls; fixture finish—acid bronze; gas consumption—30.10 cubic feet per hour; cubic feet gas per hour per square foot area—0.084; average horizontal foot-candles—6.68; lumens effective per cubic foot gas per hour—79.45.

BATH ROOM.

Observed Horizontal Foot-Candles.

Station.	Foot-Candles.	Station.	Foot-Candles.
1	1.95	4	1.25
2	1.50	5	1.14
3	1.43	6	1.01

Dimensions of room—12 ft. 5 in. x 8 ft. 9 in.; size of burners—Welsbach Junior; height of side brackets—5 ft. 11 in.; glassware—Holophane No. 2404; fixture finish—nickel; gas consumption—4 0 cu. ft. per hr.; cu. ft. gas per hr. per sq. ft. area—0.037; average horizontal foot-candles—1.38; lumens effective per cu. ft. gas per hr.—37.43.

[Communicated.]

The By-Product Ovens at Bethlehem.

As so much has appeared in the daily newspapers, and in some of the technical Journals, respecting the alleged failure of the extensive By-Product Coke Oven Plant at South Bethlehem, Pa., it will perhaps be interesting to obtain authentic information from an authoritative source. To begin with, the statements made in most of the daily newspapers are almost without exception a distressing confusion of hearsay mingled with an undeniable ignorance of the facts. It appears to be the general tendency to consider the plant, as originally designed and constructed, a complete failure. This is very far indeed from the fact as in some respects the design and results are superior to those of any plant in this country. That the operating results in some instances did not fulfill the expectations of the contractors, and hence requirements of the guarantees, is freely admitted but it is also a fact that in certain other respects the operating results considerably exceeded the guarantees.

To summarize the situation it may be said that the plant caused the greatest disappointment to its builders, as well as to its owners,

through the failure to produce the expected daily output of coke, and it was found difficult to effect a uniform heating of the oven walls without incurring the danger of local overheating of the refractory material. Shortly after this condition was discovered it was suggested that perhaps the refractory material was not sufficiently high in quality. It may not be amiss to mention at this time that the manufacturers, the Didier-March Company, of Perth Amboy, N. J., have successfully produced refractory material of unsurpassed quality for a considerable number of years, which fact is known to its many customers among whom are the largest gas works in the eastern United States and several in the middle west. It was then decided to investigate the possibility of utilizing silica material of other manufacturers in the reconstruction of some of the oven walls. This was done on a large scale but the capacity shown by the reconstructed ovens, under conditions which assured reasonable maintenance costs, were still so much at variance with the guarantees that it was finally decided to install an additional number of ovens; this made necessary by the contractural relations existing among the parties in interest. Although the experience at South Bethlehem is extremely regrettable to every fair-minded person conversant with the facts, it affords Americans a splendid and noteworthy example of the tenacity with which two representative German engineering firms adhered to their principles of fair business dealing and fulfillment of contractural obligations without once considering or seeking any means of escape from their obligations except full liquidation of the damages sustained.

Contrary to the generally accepted opinion, the South Bethlehem coke oven plant was not constructed by the Didier-March Company for its own account, but as agent for the Stettiner Chamotte-Fabrik, A. G., of Stettin, Germany, and the Berlin-Anhaltische Maschinenbau, A. G., of Berlin, Germany, according to plans and specifications prepared by the German companies. The control of the plant is now vested in its permanent operators, the Lehigh Coke Company of South Bethlehem and New York.

The two German companies, who were among the unsuccessful bidders for the extension to the plant, have no relation whatever to its original designers.

Industrial Demon. tration Rooms, Brooklyn, New York.

The use of gas fuel for industrial and manufacturing purposes is daily increasing in importance to the gas company, and to build up this desirable business is, perhaps, more than any other branch of the gas industry, a matter of education. The first requisite in such work is a well equipped demonstration room with the appliances displayed connected with gas, etc., for practical operation. The next, the development of a force of salesmen having sufficient technical knowledge of the appliances and the work to be done with them. In fitting the industrial sales and demonstrating rooms on Fulton street, these points and others were kept in mind. It was considered desirable to display such a large variety of appliances and burners as to compel the thought on the part of a visitor that gas as a fuel is available and practical for almost any conceivable heating operation. Also, to so arrange the appliances that they would make a pleasing whole, a matter somewhat difficult with such objects. For this reason, the piping as far as possible is concealed; for the large appliances run on the floor back of the apparatus, and for the smaller appliances displayed on the tables, the pipe is under the table tops, with only the manifold in view.

On entering the room one sees a series of iron-top tables on which are mounted over 100 burners and small appliances of different sizes and types, one table showing interesting specimens of work performed in gas fired furnaces. The balance of the room being occupied by appliances for hotel and restaurant work, confectioners, bakers, etc.

The heavier appliances, such as those used for the treatment of metals, are in the basement and on a concrete floor, so that such operations as brass melting in a standard foundry crucible, tire expanding, brazing, tool treating, etc., may be actually performed. A variety of metals for melting or treating are kept on hand for use in demonstrating. Those appliances that throw off considerable flue gases or odors when in operation, have sheet metal hoods connected by pipe to a ventilating flue. The electric power used for the elevators, the motor driven blowers, for the blast appliances, and the motors for pipe cutting machines in the shop, is generated by a 65-horsepower, 45 kw Direct Connected Nash Gas Engine generator set so located that it becomes a part of the industrial exhibit.

Fig. 1.

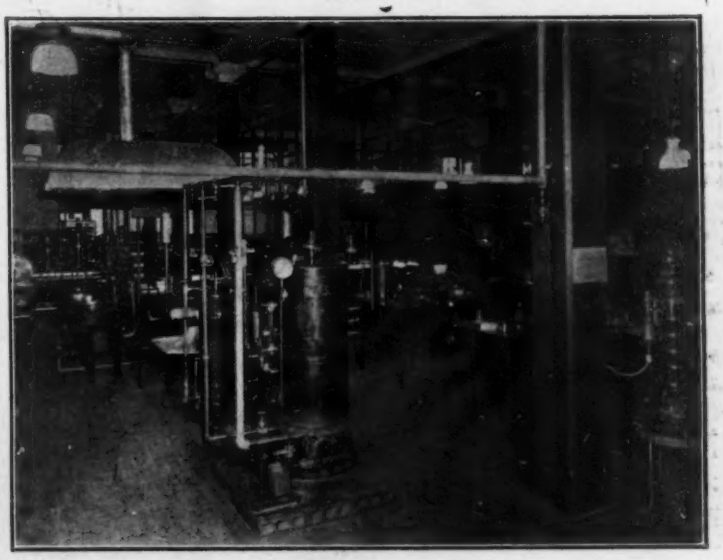


Fig. 2.

Fig. 3.

All burners and appliances are connected to the test meters having special observation dials, reading as low as one-hundredth cubic foot and will also accumulate 9,999 cubic feet. The hands of all the dials can be set back to zero, so that an observation or accumulative test may be made as desired. By-passes on the meters permit of an appliance being lighted with gas passing through the by-pass, and by merely closing a valve the visitor may make his own observation of the gas burned, starting with the meter at zero.

The greatest value of the demonstrating plant is that the manufacturer can bring his material with him and "do it with gas," and scores of consumers are gotten by this opportunity.

Public Utility Policy.

[Prepared by H. M. Moore, for Southern Gas Association, Mobile, Ala., April, 1914.]

That "the creature is no greater than its creator" is a very old axiom. What, you may ask, has this to do with the relations that should exist between a public utility company and the public? My answer is that the creature is not endowed with any greater right than the rights of its creator, but, on the contrary, has only such rights as its creator thinks it proper for it to possess. To be more explicit; a corporation, being a creature of the law, is not superior to the law, but is subject to it and must submit to regulations enacted by constituted authority, so long as they do not result in infringements of the constitutional rights of the individual.

Admitting this, one may ask what is the wisest course for a corporation to pursue in reference to legislation proposed, which the officers of the corporation fear will work an injury to their interests. By their interests I do not mean the interests that some unscrupulous individuals assume to be theirs, but the legitimate interests recognized by all just members of society. After some years of experience, I have come to the conclusion that the person or corporation that opposes all regulative legislation, on the principle that no legislation suits their policies best, is simply inviting radical action destructive in character, and creating sentiment in favor of public as against private ownership of public utilities, and the final destruction of those interests he desires to protect and exploit. It has always been, in my judgment, better to meet the authorities in a spirit of fairness, showing a willingness to give and take; and to assist in drafting regulative legislation that will do no harm to the really honest corporation, but will make dishonest corporations act honestly. Let me illustrate by giving you an instance that came under my personal observation.

For several sessions a bill had been introduced in the Texas Legislature giving cities the right to make rates at which gas, water and electric light companies should sell their product. This bill was defeated several times, but its author being returned to the legislature by his constituents and his influence being increased by successive re-elections, it was found that the opposition could not be held together, and as a consequence some other method must be adopted to avoid the disastrous effects of the bill as drawn. An agreement was finally reached by which the bill was amended so as to provide that no rate should be made that would not permit companies to earn 10 per cent. on their investments. The bill was passed with this amendment and it has not injured any corporation in the State. In another case, where the gross receipts tax bill was in course of construction before the Committee on Revenue and Taxation, all rates had been adjusted except that on street railways. A sub-committee was appointed to confer with a committee representing the operators for the purpose of fixing this rate, and being a member of the committee representing the operators, I attended the conference, but not being a street railway man I did little talking. After much arguing, the chairman of the committee asked the street railway representative what they thought they could stand and not be hurt. A gentleman representing most of the capital interested insisted that they could not stand anything. The chairman retorted: "Mr. ——, it is no use to argue that point. You are in the position of the criminal who has been indicted, tried and convicted. What is the penalty?" At this point another member of the committee representing the street railways came to me with the remark, "We have got to accept something." I replied, "Yes, I have already accepted a rate for the gas companies." But it was impossible to reach an agreement and the result was that the rate was arbitrarily made, and is higher than it probably would have been by agreement.

I know some operators of utilities who are opposed to all regulation. Such men have no weight with legislative committees, and it is not good policy to so express oneself, for the advocates of regulation realize at once that they can expect no co-operation from such individuals, and care nothing for their views. Much more is accomplished by agreeing with your regulators in matters that are harmless, and securing from them concessions where harm is likely. I lately heard a representative of corporate interests state before a legislative committee that he was opposed to regulation on principle. This statement at once put him in poor standing with the committee, as was shown by their lack of interest in his subsequent remarks; but they were all interest when another representative of the interests stated that he was not opposed to regulation, but was against the bill under consideration. When the latter's time allowance was exhausted, the committee, on its own motion, extended it, so that he might finish his discussion of the bill. The bill was never reported back to the committee. It is no longer good policy to send attorneys before legislative committees to discuss legislation affecting corporations. The legislators prefer to have the managers or operators to deal with. I have heard them express themselves many times on this point, and with no uncertain sound.

The local manager of a public service corporation is a very important personage to the company. He is the company itself so far as its patrons are concerned, and it is essential that he have those qualities of character that will permit him, while looking after the interests of the company, at the same time to look after the interests of its patrons. I do not mean that he must take a hand in the management of their businesses, but that when he is dealing with them he should do so in such a way that the patron will know that he or she has been treated fairly. It is my rule in talking gas to prospective consumers to tell them as nearly the truth as I can, and I always impress upon my employees my desire in that direction, and have them understand that I will not permit any misrepresentations as to gas consumption or other qualities of gas appliances. I also insist that every contract made by one of my employees, authorized to make contracts, shall be carried out, no matter whether the contract was just according to my wishes or not. I prefer to have the good will of our consumers rather than that a few dollars be made on the work, and I find that in the long run the company is benefited.

Utilities are subject to many complaints. Whether just or unjust, they must be attended to, and it is to the interest of the company that they be attended to promptly. It is the manager's duty to see this done if he wishes the patrons to believe that he wants them to have good service; and is not trying to get out of them all he can, while giving them as little for their money as possible. Distribution expenses are an important factor in gas cost, and should be held down as much as consistent with good business policy, but the manager is not always properly chargeable with the failure to make these costs low. Sometimes the managing owners are responsible, because they sit in an office hundreds of miles away, and when necessary improvements are asked for wait until a heavy loss of business resuls, and then discharge the manager and install another before doing what should have been done. No manager can make a good record for himself or his employers unless he has their co-operation and confidence; and no one should want to be associated with a managing owner who is not willing to believe that he is trying to advance the interests of the owners. It is impossible for an officer of a company, sitting in his office in a distant city and only visiting the city in which he is operating once or twice a year, to know the true conditions under which his manager and employees are compelled to work, unless he accepts their statements as to those conditions. If he has not confidence in his employees they will be handicapped in their dealings with the patrons and had better be changed; and others who have his confidence substituted. Courtesy towards the public should be practiced at all times. I know it is sometimes difficult, and occasionally an individual will not permit you to treat him in a courteous manner, because he does not know how to be courteous himself; but such cases are rare, and much depends upon the treatment given the public by a utility company's employees.

Technical Development of Surface Combustion.

In his second lecture on Surface Combustion, before the Royal Society of Arts, in London, Professor Bone told something of the technical developments of the method. It was in 1906, after the publication of the first instalment of his researches, in conjunction with Mr. R. V. Wheeler, that he decided to develop the idea technically, and made arrangement with Messrs. Wilson and Mathiesons, of Leeds, to co-operate with them in the matter. Before the work had gone very far the Institution of Gas Engineers and the University of Leeds appointed a committee to investigate the efficiencies of gas fires, making him a member of the committee, and the work had to be carried out in his laboratories at the University of Leeds; and it was thought inadvisable for him to at the same time direct anothor investigation for a firm of gas stove makers. He therefore suspended for a time the development of his ideas of surface combustion until July, 1909, when work was resumed at Wilsons' and Mathieson's works, and in October, Mr. C. D. M'Court became associated with the enterprise.

On October 16, 1909, before any further experiments was made, Professor Bone deposited with a bank a sealed envelope containing this statement, defining the nature of the problem and his proposed solution of it:

"To bring a combustible mixture of gas and air in suitable proportions into contact with the interstices of an incandescent porous solid of suitable composition and porosity, in such a manner as to produce a flameless, or as nearly as may be, a flameless surface or interstinal combustion, whereby the porous solid shall be maintained in a continual state of incandescence."

The envelope was not opened until October, 1913, and he now places its contents on record as evidence of the precise position to which the scientific researches in the laboratory had led him before the industrial investigation was begun.

Professor Bone then described and demonstrated, by lantern slides and experiments, applications of "diaphragm" surface combustion heating to the boiling water, the concentration of sugar solutions (in which it has been largely used for over a year), and to the evaporation and concentration of other liquids. In the work the incandescent diaphragm is mounted over the pan containing the liquid, and as the concentrate accumulates on the surface it is skimmed off, exposing a new surface of liquid to the heat. The advantages of this method of evaporation are obvious, but its commercial development is primarily a question, not so much of thermal economy as of the cost of gaseous fuel compared with coal. Thus with coal at $3 per ton and coal gas at .25 per 1,000 cubic feet, the the cost of a given number of heat units is still about 4½ times as great in the form of gas, although the greater economies and other advantages obtainable with gas, largely wipe out the difference in final cost. But in localities near coal fields, where coking plants are established, coke-oven gas should be obtainable at a price which would make this use of the diaphragm a commercial proposition.

Burning the explosive mixture of gas and air in a bed of granular material, is applicable to all kinds of gaseous and vaporized fuels, and can be used for heating all kinds of furnaces. It is not essential that the bed of refractory material should be very deep, quite a shallow bed sufficing to complete combustion. Neither is it necessary that the bed be disposed around the vessel or chambor to be heated, for if contact with the burned products is not objectionable, a shallow bed may be arranged within the heating chamber itself, or the refractory material may be packed into tubes traversing the substance or medium to be heated. The temperatures obtainable are limited only by the ability of the furnaces to withstand them, and the heating is very uniform and easily controlled. The temperature for a given furnace fired by a gas of given uniform quality is determined by the amount of gas burned per unit time in the bed, or, in other words, by the rate of heat developed in the bed.

In a test with a surface combustion muffle furnace, 9½ inches long, 5½ inches wide, and 3½ inches high, fired with gas of 500 B.T.U. net, the following results were obtained:

Temperature in Middle of Furnace	Gas Consumption to Maintain Temperature Constant.	Temperature of Products.
1,499° F.....	21.0 cu. ft.	1,004° F.
1,840° F.....	35.5 cu. ft.	1,193° F.
2,201° F.....	58.0 cu. ft.	1,598° F.
2,596° F.....	79.0 cu. ft.	1,985° F.

The temperature of the products was in every case 495° to 611° F. lower than that of the muffle, and even with the temperature at 2,596° there was no flame at the top of the furnace.

In a test with a muffle of the same size heated by flame contact, the gas consumption to maintain it at 1,931° F. (the maximum temperature obtainable) was 105 cubic feet per hour, whereas the consumption of the surface combustion furnace at the same temperature would have been about 43 cubic feet. The results of these and other tests upon medium sized muffle furnaces proved that to maintain a given temperature between 1,472° and 2,552° F., a properly constructed surface combustion furnace would require only between 40 and 70 per cent. of the gas used in an ordinary flame-heated furnace of the same dimensions. The advantages in favor of surface combustion increase with the working temperature. This conclusion was confirmed by tests made in New York, in which a surface combustion muffle furnace was pitted against the best American types of similar dimensions, with the result that, to maintain a temperature of 2,552° F., the surface combustion furnace practically halved the gas consumption of the American furnace; and to maintain 1,472° the gas consumption of the surface combustion furnace was about 0.7 of the American furnace.

In large muffle furnaces, regenerative arrangements might advantageously be added with consequent greater heat economy. By means of a simple regenerative device we had been able to maintain the muffle at 1,832°, while the waste gases were less than 392°. In another type of recuperative furnace, with a working space of 3 feet 1 inch by 3 feet 2 inches by 1 foot 6 inches, fired by washed producer gas of an average net calorific value of 139 B. T. U., both air and gas being heated by the sensible heat of the waste gases, the following results were obtained:

Hour.	Gas Consumption, Cubic Feet per Hour.	Fahrenheit Temperature of Furnace.	Hot Gas.	Hot Air.	Burned Products.
9.35.....	7,360	1,472	221	408	341
10.0	7,280	1,805	272	376	403
11.0	6,720	2,228	363	507	551
12.0	6,280	2,381	448	588	622
1.30.....	4,920	2,489	563	...	...
3.45.....	5,200	2,570	608	...	752
5.0	4,920	2,543	...	...	734

Analyses of the burned gases leaving the furnace showed only 2.0 to 2.4 per cent. of oxygen.

Many difficulties must necessarily be encountered in applying a revolutionary idea of this sort to the firing of large industrial furnaces. Would-be designers and users of surface combustion furnaces must know what surface combustion really is before they can hope to realize fully its possibilities, and people whose experience had been built up on the old system of flame heating must be prepared to learn a good deal and to reverse their notions.

Professor Bone concluded the lecture by giving these results of a test of melting lead by granular-bed surface combustion:

	Cent.	Fahr.
Temperature of metal charged.....	15°	60°
" " tapped.....	372°	702°
" gases leaving apparatus..	500°	932°

Lead melted per hour = 1,176 pounds.
Gas burned " = 100 cubic feet at N. T. P.
Net calorific value of gas = 559 B. T. U. per cubic foot N. T. P.

Heat required to raise 1,176 lbs. of lead from 15° C. to 372° C. = 1,176 × 32.67 = 38,420 B.T.U.

$$\text{Ratio } \frac{38,420}{55,906} = 0.686$$

Actual efficiency of the operation, considering that the bath was maintained at 372° C. = about 80 per cent. of that theoretically possible.

Copper Coating to Obtain Soft Areas in Case Hardening.

In a late issue of "Engineering," London, a correspondent tells of his experience with copper; after trying fire clay, which commonly cracks off; and of leaving more material on the parts required to be soft than is needed in the finished article.

He found 0.001 inches of copper sufficient to resist any vigorous attack of the case hardening material.

A good copper-depositing solution can be made as follows: To prepare 1 gal. of cyanide coppering solution, take 3 oz. of copper sulphate ($Cu\,So_4\,5\,H_2O$) which contains 25.4 per cent. of the metal copper, and dissolve in a half pint of hot water. Add to this 4 oz. of sodium carbonate, or the ordinary washing soda ($Na_2\,SO_4\,10H_2O$) also dissolved in hot water. After they are mixed together a green precipitate will form which should be poured on a rag or filter to drain the water from the precipitate. The green precipitate should then be redissolved with about 1¼ pints of ammonium hydrate, and will change to a very deep blue color. Then prepare a quantity of potassium cyanide solution as follows:

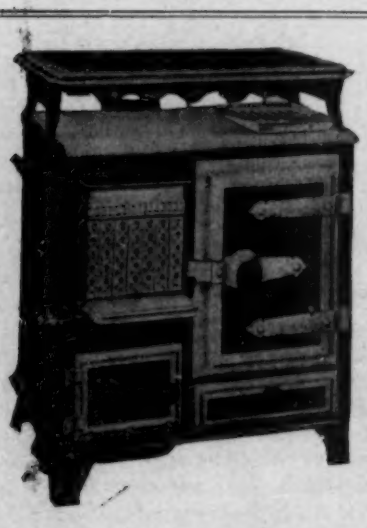
Dissolve ½ lb. of lump cyanide of potassium in half a gallon of hot water, care being taken not to inhale the poisonous fumes from the solution. Pour it into the vessel containing the precipitate and ammonium hydrate, until the color changes to that of old ale. At this point read off the quantity of cyanide solution used to de-colorize from blue to that of old ale, and then add a further 25 per cent. to insure completion. The whole bulk can now be made up to 1 gal. by

the addition of water (rain water if possible) when the solution will be ready for use.

The plating solution is an alkaline one, and works better when at about 150° F. The plating solution can be worked with bunsen cells, or with current taken from a plating dynamo. A suitable voltage would be about 3 volts across the vat terminals. After the plating-vat has been in use some hours, should a green incrustation begin to form upon the copper anodes, it denotes insufficient KCN; therefore more potassium cyanide should be dissolved and added to the vat, until this green incrustation disappears. As an experiment, add about 1 pint, and then work the plating solution for a few hours and note results.

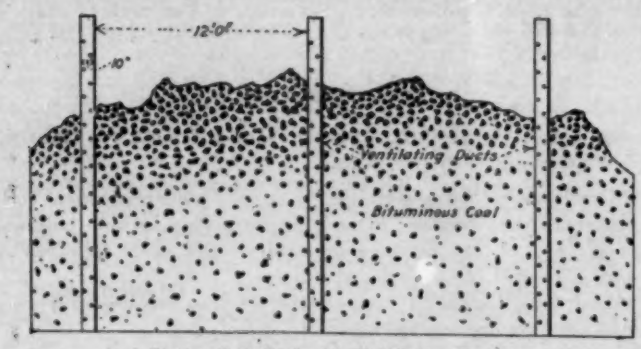
The alkalinity of the plating solution can be tested by litmus paper. To prepare the article to receive the coating of copper on the portion required to be left soft, it does not require a polished surface, but simply to be free from grease. The copper will deposit direct on any clean casting or forging, and after case-hardening the film of copper can be readily removed with a pocket-knife.

New Methods and Appliances.



AN ENGLISH RANGE.—To provide heat for the "all gas kitchen," an English manufacturer of gas ranges includes in the appliance a radient heater. The stove shown is made by the Stime Company, and combines range, water heater and room heater.

VENTILATING COAL PILE.—In preparing its coal storage the Swinehart Tire & Rubber Company, Akron, O., has adopted a scheme whereby it hopes all danger from spontaneous combustion will be eliminated. At 12-foot intervals throughout an 800-ton pile of coal, vertical vent pipes have been placed, The ducts, a square box of 10 inch boards, in which 1-inch holes have been bored on 6 inch centers, are placed upright on the site to be used for coal storage and the fuel is dumped about them. Carrying off the heat and gases formed in the interior of the stored coal, thus preventing undue rises in temperature and formation of gas pockets



Storing Soft Coal with Ventilating Ducts.

is the chief function of the wooden ventilators. The experience of the company with run-of-mine coal has shown that spontaneous combustion need not be feared with vent pipes placed vertically on 12-foot centers. If slack coal is to be stored, it would be good policy to install horizontal vents leading to the risers.

FIRE-DAMP AS A FUEL.—In the course of a discussion on a paper on "Fire-Damp in Coal Mines," Dr. Harger said that by collecting the fire-damp in concentrated form it would, instead of being regarded as a danger and a nuisance, at once become a very valuable asset. As an example, it was stated that a mine in Yorkshire gives off every 24 hours 4 million cubic feet of fire-damp—sufficient to supply several large towns with gas. This, he thought, was a striking illustration, but he ventured to put it in a more practical manner, thus: The 4 million cubic feet of gas weigh about 82 tons; and taking into consideration the more complete combustion possible with gas for heating, it is equivalent to 150 tons of the best bituminous coal, and if used direct in gas engines it is equivalent for power to 200 or 250 tons of coal a day, or nearly 100,000 tons per annum.

Items of Interest
FROM VARIOUS LOCALITIES.

AT the meeting of the Mauch Chunk (Pa.) Gas Company, J. C. Loose was elected to serve as Director, in place of Hon. L. H. Barber, recently elected as Court Judge, and A. W. Butler in place of the late Asa P. Blakslee. The Directorate is now Messrs. H. A. Butler, A. W. Butler, J. C. Loose, A. E. Forstall, A. H. Strecker, S. P. Curtis and H. L. Pobst. They elected H. A. Butler, President; A. H. Strecker, Vice-President and General Manager; and E. Causbrook, Secretary, Treasurer and Superintendent.

ALAN DEAN WHITTAKER, Superintendent of the Atlanta (Ga.) Gas Light Company, told the members of the Ad Men's Club all about Atlanta gas—the kind for which you pay $1 per 1,000 cubic feet—at the weekly luncheon of the Club, at the Hotel Ansley, last week. More than 50 members of the organizatien heard the talk, which was one of the most interesting the Ad Men have heard recently.

WHEN the big gas tank in Brighton was erected by the Rochester (N.Y.) Railway and Light Company, there was considerable opposition on the ground that it would be unsightly and detract from the natural beauty of the surrounding country. Promise was made at the time that it would be made a thing of beauty, and the tank is being painted an inoffensive gray, and in its new garb will harmonize with the colors in the sky. There will be no clash of effects to jar the aesthetic sensibilities of the most exacting. Walks are being laid, with fence and concrete posts, and a lawn is being seeded down with further improvements contemplated for next season.

THE Washington (D. C.) Gas Light Company has just concluded a very successful exhibit and demonstration at its 14th street show rooms. Included in the exhibit was every style and type of gas light, from the old-fashioned lava tip open flame to the newest development in mantle lamps; water heaters, various styles of gas heaters, kitchen ranges of the most modern type, and a number of devices such as gas irons, toasters, etc., for the purpose of lightening the work of housekeeping. Afternoon and evening demonstrations of cooking were given by Mrs. Mary Harris Hoar, expert demonstrator of the company, and short talks on the use of gas and gas appliances, as well as addresses on the aims and purposes of the company, by officials of the company.

THE new plant of the Girardville (Pa.) Gas Company is now in operation and main extensions are being made to Gilberton and Frackville.

"M. G.," writing from Woodstown, N. J., says that the New Jersey Gas Company has installed an 1,100-candle power high pressure gas lamp at the local public fountain, to demonstrate the possibilities of gas arc lighting. It gives a flood of light and illuminates a very large area of the street.

THE Ypsilanti (Mich.) Gas Company has notified the city officials of its refusal to accept their offer of $75,000 for its plant. No other answer could have been expected by practical business men.

THE Stamford (Conn.) Gas and Electric Company is going to considerable expense in laying its pipes on Main street, to insure against the ravages of time, so far as the quality of the pipe and its endurance is concerned. The galvanized iron pipe is being covered with two coats of asphalt and a rubberized cloth, which, it is claimed, will keep the surface of the pipe free from corrosion for 200 years. The work is costly, but it is said that the results are worth it.

NEGOTIATIONS are pending between the Malden and Melrose (Mass.) Gas Company and the B. S. Converse estate for the purchase of a large lot of land fronting on Washington street, Malden, opposite the Centre Methodist Church. If successful, the Tenney interests will build a brick structure which will be devoted exclusively to the use of the Company. The lot has a frontage of 120 feet and a depth of 100 feet.

IT is rumored that the Henry L. Doherty Company will attempt to enter into competition with the Citizen's Gas and Electric Company for the right to supply electricity for municipal and mer-

chantile lighting in Lorain, O. Council may be asked at its next meeting to consider rates which the Company will submit. The Doherty Company now supplies electric lights for Elyria, Amherst and other nearby towns, and is able it is said to furnish electricity at a low rate in Lorain.

A FRANCHISE was granted by the city council of Cordele, Ga., to the Illinois Gas and Water Company to install a gas plant. The council requires a cash bond of $5,000 placed in one of the local banks to show good faith, which the Company has already expressed a willingness to make. It is proposed that work on the plant begin in six months, to be completed in two years.

THE City Council of Mankota, Minn., has passed an ordinance, effective June 1st, calling for $1 gas. The makers, the Mankota Power Company, will, however, be allowed to collect a 10 cent penalty on all gas not paid for by the 10th of the month following the billing. Previous rates were gros, $1.50, and net, $1.25 to 85 cents.

MESSRS. C. F. Cattell, J. R. Schroll and E. S. Cattell have applied for a charter for a company to furnish commercial gas to the Borough of Christiana, Pa., and the townships Sadsbury, Paradise, Salisbury, Leacock and East Lampeter.

A MEETING of the employees of the Ithaca (N.Y.) Gas Light Company and the Ithaca Electric Light and Power Company was lately held at the office of the Company, its purpose being to make every employee better fitted to perform his work for the Company as well as the public, and to bring the employees of the various departments in closer touch with each other. These officers were elected: John Brooks, President; Harry Potter, Vice-President; O. E. Wasser, Secretary; L. C. Boynton, Treasurer. The association will meet every Friday evening, at the office of the Company, South Cayuga Street, and while the meetings will be of a more or less technical nature, the social side will not be neglected, as it is the intention to hold banquets occasionally, and in other ways to make the association helpful to all employees.

R. B. WAGNER, Secretary of the Gratiot County Gas Company, announces that work is in progress constructing the plant and offices for the Company at Alma, Mich., the headquarters, and laying pipe to furnish services to St. Louis and Ithaca, while plans are to serve Breckenridge and Merrill by fall or winter. The construction work is being done by the American Gas Construction Company, of Newton, Ia. The Gratiot Company, capitalized at $30,000, was organized in March, and last month made a start towards building operations and piping. C. F. Brown, of Alma, is President and General Manager of the Company; R. B. Wagner, of Grand Rapids, Secretary; Francis King, of Alma, Vice-President; Fred. Rowland, of Alma, Treasurer.

THE Northern Connecticut Light and Power Company has acquired a plot of land in the township of Enfield, Conn., with the intention of building thereon two large storage holders for the better supply of its consumers in the nearby villages.

THE Old Colony Gas Company, Braintree, Mass., reports an output for 10 months of the present fiscal year of 50,272,000 cubic feet, or an increase of 40 per cent. over the same period last year.

"C. I. E.," WRITING from Redkey, Ind., under date of the 18th inst., says: "As predicted, the Citizens' (natural) Gas Company, although out of debt, and able to start its fiscal year with a small balance, will be unable to serve the whole of the town again, and at its meeting adopted a retrenchment policy, cutting out the south business. Sixty consumers are now on the books and the receipts of the previous fiscal year were about $1,000. The work of improving the decaying service was threshed out time and again, and the one suggestion is that more consumers be induced to join those north of town. Many lines do not pay, the pressure of the wells are low, and retrenchment was absolutely necessary."

PUBLIC Service Commissioner Maltbie has reopened the rate case in regard to the Kings County (N. Y.) Lighting Company's charges for gas in the Thirtieth Ward, the Gravesend and Coney Island region. The complainants are John G. Mayhew and others. When the matter was up last year the commission, on the recommendation of Mr. Maltbie, ordered the company to reduce the rate to 95 cents a thousand. The company obtained a writ of certiorari and took the order into the courts. The Appellate Division, in May of last year, decided against the commission, which took the case to the Court of Appeals. The Appellate Division's opinion sustained the commission's action except in respect to the "going value," the paving over mains and the annual increase in land value as part of income. The Court of Appeals, while agreeing with the Appellate Division as to "going value" and annual increase in land, disagreed with it and sustained the commission in regard to paving over mains. It also greatly enlarged the Appellate Division's opinion as to the nature of "going value" and discussed at length the elements which should enter into a consideration of "going value" in rate cases. The proceedings practically repeated the evidence before presented, but the decision of the case will be according to the new elements imparted into it by the decision of the court of last resort.

EMPLOYEES of the Darby (Pa.) office of the Suburban Gas Company who are taking a special course of lessons in their work with a view of attaining greater proficiency, were given a very interesting talk, at their class meeting last Monday night by Edwin C. Bartlett, of the Bartlett Company, representatives of the Ruud Water Heater Company. Preceding Mr. Bartlett, Chas. J. Fox, Superintendent of the Darby district, gave the boys an interesting talk.

SUPT. LANE, of the Lenawee County Gas and Electric Company, Adrian, Mich., has had a strenuous experience. A friend writes us that the loss during the flood by the Lenawee County Gas and Electric Company amounted to nearly $10,000, from coke washed into the river and other incidental damages to machinery. Nearly all of the huge pile of coke stored southeast of the plant, on the Lawrence Park flats, was swept away by the water, about 1,800 tons, valued at $5 per ton. The gas plant did not stop operation at any time, although officers of the Company expected that they would have to do so when the city water supply was cut off. With four feet of water in the generator house, a force-pump, purchased for the emergency, pumped water for the boilers and other parts of the gas-making machinery, with the possibility that at any minute an additional rise of water would put them out of business.

HENRY W. DOUGLAS, Treasurer and General Manager of the Washtenaw (Mich.) Gas Company, Samuel T. Douglas, President of the Ypsilanti Gas Company and J. B. Cole, Manager of the Chelsea branch of the Washtenaw Gas Company, will soon build a new gas plant in the city of Tecumseh, controlling franchises both in Tecumseh and in Clinton, 5 miles away. The franchises were secured a year ago, but it was only recently decided to start on the new plant immediately. The two cities together have a population of about 10,000, and the new plant will be about the same size as the one in Ypsilanti. Unless the difficulty between the Ypsilanti Gas Company and the city of Ypsilanti is soon settled, the entire equipment of the Ypsilanti plant may be moved to Tecumseh.

THE first annual dinner of the Flatbush (N. Y.) Gas Company's Employees' Association was successfully held at Knippert's Hotel, Ocean Parkway and Caton place, where about 150 of the members gathered and made merry. The affair was strictly informal, without speeches. Local talent rendered the musical numbers, in which all the diners joined. Mr. Henry E. McGowan, former Manager of the Flatbush office, was the guest of the evening.

THE St. Petersburg (Fla.) gas plant will be built by the J. H. B. McCreary Company, of Atlanta, Ga., as engineers under the terms of a contract that is now being drawn. The distribution system will be installed by the municipality itself; the contract for the generating apparatus, purifiers and condensers has been given to the Gas Engineering Company of Trenton, N. J., and the holders will be built by R. D. Cole & Co., of Newman, Ga.

MR. ROBERT E. FREEL, Superintendent of the Clinton (Mass.) Gas Light Company, was married on the 12th inst. to Miss Elizabeth G. Cannon, of that city. Among the many wedding presents, was an elaborate buffet from the employees of the Company.

Utilities Commission News.

NEW JERSEY LIMITS SHUT-OFF ORDERS.—The New Jersey Commission has ruled that a company is not warranted in cutting off the supply of gas to a customer who has failed to pay a bill within the time limited by the company's rule, when the customer has a cash deposit with the company, amounting to more than the unpaid bill.

The memorandum is as follows: "The deposit is a sum of money in the company's hands, which is answerable for the payment of the consumer's account, whenever there is a default in the payment thereof in the ordinary course. In this view, the company should have applied so much of this fund as was required to cancel complainant's charge for gas consumed. In this situation, with complainant's debt extinguished, is one day's notice of a purpose to discontinue service reasonable? We think not. In the judgment of the board the company would be warranted in giving notice to the customer to restore the deposit to the original amount within a reasonable time or, in case of failure to so renew the deposit, that the account would be closed and the deposit returned, after deducting all service charges to that date.

"The company urged that transferring so much of the fund as would satisfy debts due would entail increased bookkeeping. This is undoubtedly true. It must not be overlooked, however, that the company is debtor to the consumer to the amount of the deposit, and that its possession renders the company's account secure, and such bookkeeping as is entailed is required by the business of the company."

OHIO COMMISSION MODIFIES ORDER.—Upon a rehearing in the case of A. W. French against the Miami Valley Gas and Fuel Company, the Commission has modified its previous order on the classification of users. It disclaims any intention to disapprove a classification for use of gas under boilers, in gas engines, etc., but states that so long as the defendant company maintains the two classes, the modification "under boilers" for factory use cannot be considered sufficient to throw gas engine users in the domestic class. The original order, rendered several month ago, was generally interpreted by the public as an announcement that the Commission would consider factory use final, and that the company under no circumstances would have any authority over the method of consumption, the customer having the right to use the gas either in gas engines or for fuel purposes.

MONTANA REGULATIONS.—Twenty-three rules for the control of gas and electric utilities have been promulgated by the Montana Public Service Commission recently to take effect June 1st. On March 25th tentative rules drafted by the Commission were considered with representatives of the companies affected and their suggestions and criticisms were considered in drafting the rules decided upon.

One of the rules provides that meters must be tested upon request of consumers, unless such a test has been made within one year. If the meter be found correct, the consumer must pay the actual expenses incurred in making the test, and if fast beyond the allowable limit, the company must pay the bill. Where meters are found to be fast, settlement for over-charge is to be made on basis of the disclosed error and for a period of time covering one-half of the interim since date of last test, unless it is shown conclusively the irregularity existed for some definite period.

OHIO COMMISSION EXTENDS TIME.—While the Public Utilities Commission of Ohio has passed the order providing for valuation of public utilities and interburban railroads, it has allowed several applications in specific cases for extensions of time for filing inventories. Originally the Commission expected to require the information to be filed as of April 1, 1914, but later it decided to order that the information requested should be filed on or before August 1, 1914, thus allowing an extension of time amounting to 4 months for the preparation of the necessary data.

THE Sacramento (Cal.) Gas Company is trying to establish before the California Railroad Commission its right to require a deposit of $5 before turning on the gas in a prepayment meter, and also to obtain an increase in the gas rate to $1.50 per 1,000 cubic feet. The Commission is inclined to refuse authority to require the deposit on prepayment meters, because a coin must be deposited before gas can be obtained, and there is no need of a guarantee. To answer this the company made an exhibit before the Commission, consisting of more than 25 pounds of slugs, beer checks and other materials found in prepayment meters and all removed in the last year. The disks were deposited in meters in rooming houses, where the gas was supposed to be paid for by transients. It is to stop these practices that they want a $5 deposit even on prepayment meters.

Financial Notes.

EARNINGS of the subsidiaries of the Massachusetts Gas Companies have been showing decreases since last October, with an aggregate decline in net earnings for the half year of $136,563, while the corresponding period of the preceding year showed a gain of $259,418. It is thought that for the last 6 months of the fiscal year earnings will at least break even, if they do not show a slight increase. The average decline in receipts from sales of gas was about 15 per cent. in the 6 months. While the common stock of the Company has declined, it is not thought there will be any question of payment of the regular common dividends in the next year. The trustees will meet in June to take action on the dividends for the coming year, and it is practically certain that they will be at the usual 5 per cent. rate. The decline in the stock has resulted in an increase in the number of holders of the common stock to 4,500, compared with 4,000 a year ago.

SIX of the subsidiaries of the American Gas and Electric Company report gross earnings of $2,907,582 for the year ended March 31, 1914, an increase of $387,238 over the previous year. The net, after taxes, was $1,558,442 for 1914, an increase of $292,266 over 1913. The surplus after charges, was $979,196, as against $771,262 for 1913, an increase of $207,934. The increase in surplus after charges amounts to a shade less than 27 per cent. over the previous year.

THE Elmira (N. Y.) Water, Light and Railway Company, a subsidiary of the United Gas and Electric Corporation, is paying at the New York Trust Company the $1,250,000 one-year 6 per cent debenture notes, matured May 1, and issued last year in connection with the construction of a new central generating station and the retirement of an issue of underlying bonds. Financing for the maturity of the notes was by the sale of $617,000 5 per cent first and consolidated bonds, and $850,000 7 per cent. first preferred stock.

Elmira Water, Light and Railway Company has also sold $317,000 5 per cent. second preferred stock, and the proceeds of this will be used for the retirement of $307,000 6 per cent. first mortgage bonds of the Chemung County Gas Company, an underlying subsidiary. The bonds will be called as of date of July 1.

THE regular quarterly dividend of 1¼ per cent. has been declared upon the preferred stock of The Atlantic Gas & Electric Company, payable May 15th to stockholders of record on May 1st.

The American Light & Traction Co. for the 12 months ended Mar. 31, 1914, shows earnings on stocks of subsidiary companies of $3,712,368, as compared with $3,748,841 in the preceding year. Miscellaneous earnings were $710,398 as compared with $571,529. Gross was $4,422,766 as compared with $4,320,370. Expenses amounted to $130,882 compared to $117,489 in 1913, and net earnings were $4,291,884 as compared with $4,202,881. Total surplus earnings were $13,180,674 as compared with $12,235,092. Cash dividends on the preferred stock were $854,172, and on the common stock $1,374,497.

ELECTRIC Bond & Share Company's financial statement as of Dec. 31, 1913, shows investments of $9,313,478, of which $6,689,350 represents stock and $2,624,128 represents bonds and coupon notes. Syndicate holdings, underwritings and advances amount to $4,187,704. The surplus was $3,187,714 and reserves were $101,000.

AT the annual meeting of stockholders of the Fairmont (W. Va.) Gas Company the Board of Directors was re-elected, as follows: W. L. Hutchinson, J. A. Clark, J. M. Hartley and J. O. Watson, all of Fairmont; Russell Palmer, of New York; J. H. Wheelwright, George C. Jenkins, J. M. Dennis, John S. Gibbs, Jr., Joseph P. Kennedy and Howard Bruce, of Baltimore. Directors re-elected the officers as follows: President, J. H. Wheelwright; Vice-President, J. O. Watson; Treasurer, Walton Miller; Assistant Treasurer, John Rock, Jr.; Secretary, Frank B. Pryor; Assistant Secretary and Assistant Treasurer, A. S. Dunham; General Manager, C. H. Evans. The preferred stock will be put on a 7 per cent. dividend basis. It is generally understood that the company is earning more than sufficient to permit the common stock to pay dividends at the present time.

A LETTER has been sent to the stockholders of the Consolidated Gas Company, of New York, by George B. Cortelyou, the President, stating that the Company has applied to the Public Service Commission for permission to issue $25,000,000 8 per cent. 5-year convertible debentures, convertible at the end of 3 years. The Commission is expected to hold public hearings as to whether the convertible debentures shall be issued to shareholders at par, in the proportion of 4 to 1 or at a price higher than par. It will probably be some time before the sanction for the issue can be obtained. A special meeting of the stockholders is to be held on May 25, for the purpose of authorizing an issue of $25,000,000 stock to provide for the convertible feature.